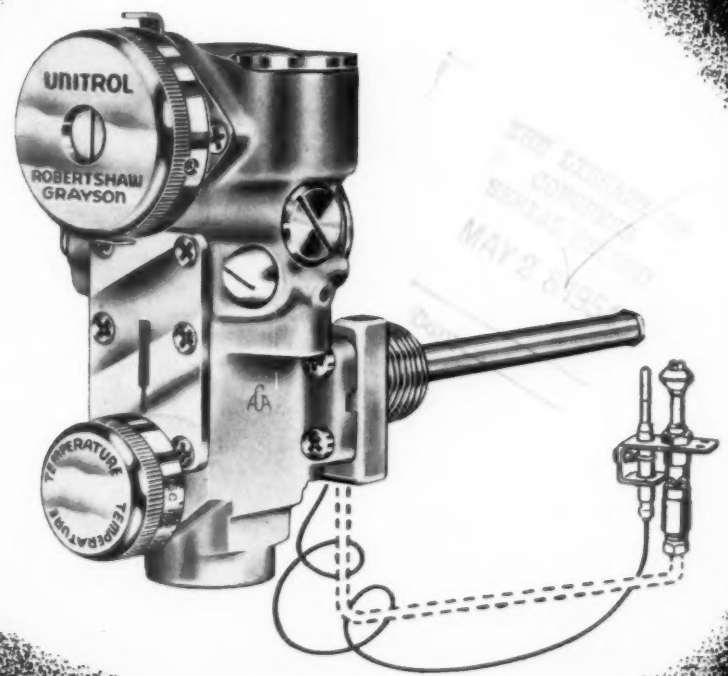
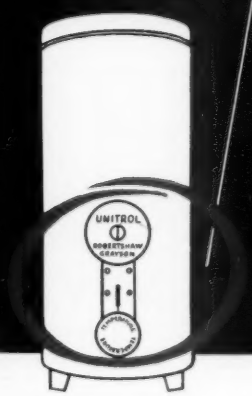
VOL. 180 No. 3 AMERICAN MARCH, 1954

Gas Journal

Puts the "Sell" in water heater Selection





ROBERTSHAW-GRAYSON **UNITROL**®

You get added saleability and your customers get top operating performance with automatic water heaters equipped with UNITROL.

Robertshaw-Grayson's extensive national advertising has educated your prospects to accept the fact that the performance of a water heater depends upon the Control's performance...and that when the heater they buy is Robertshaw-Grayson *controlled*, they get the very best in quality performance.

Mechanically, Unitrol A is the finest water heater control of its kind. It's a completely integrated unit with main gas cock, thermo-magnetic 100% safety pilot, snap-action thermostat, pilot adjustment valve — all contained in one beautifully designed and machined housing.

Large pilot filter — all parts removable from front — removable without breaking water connections — water leaks cannot enter gas line, and vice versa — all parts impervious to gases and immune to corrosion.

Select the control that helps you sell—

Robertshaw-Fulton CONTROLS COMPANY

ROBERTSHAW THERMOSTAT DIVISION, Youngwood, Pennsylvania
GRAYSON CONTROLS DIVISION, Lynwood, California

B 474762

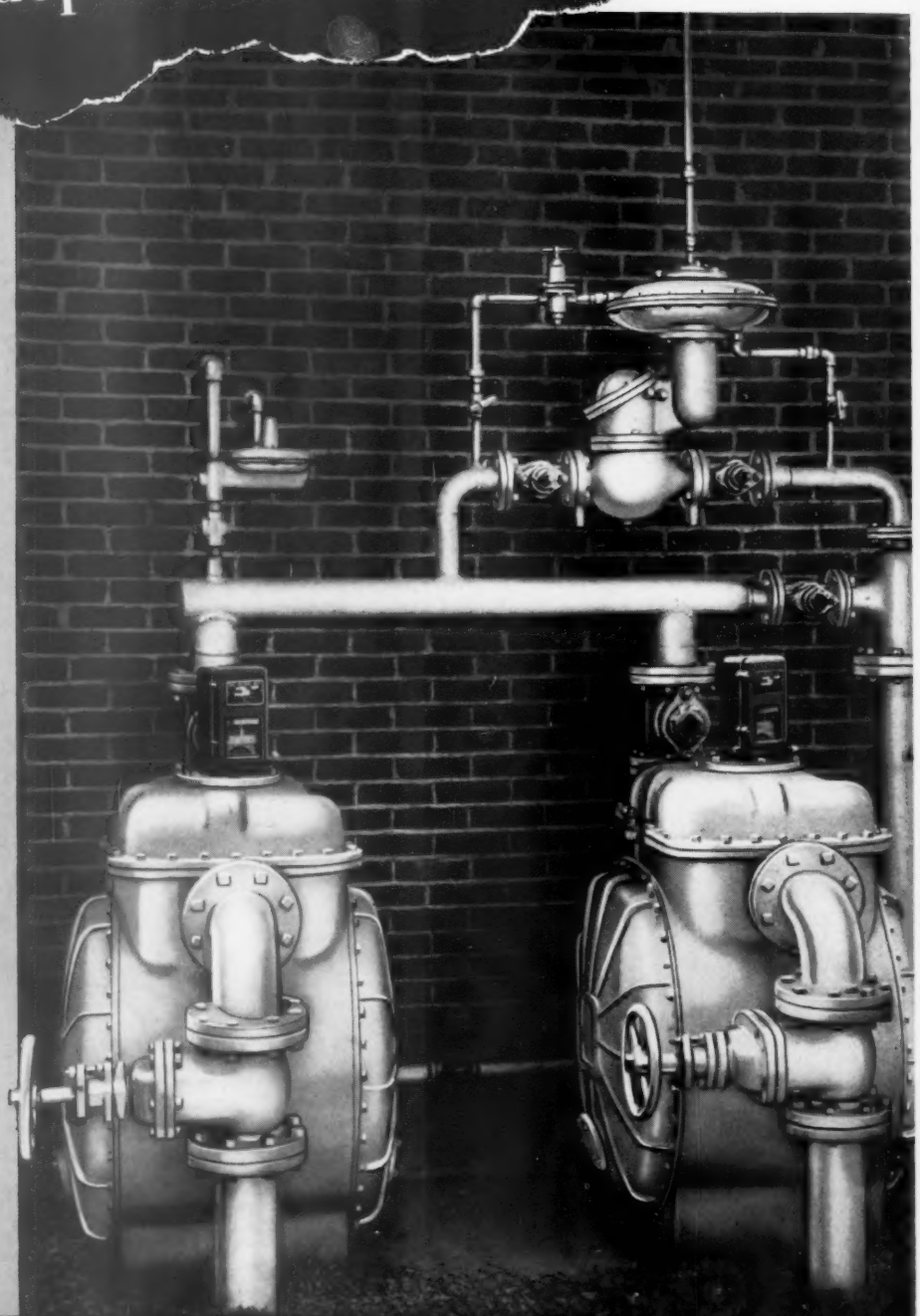
TRIPLE ASSURANCE
of accurate measurement and dependable regulation

AMERICAN® IRONCASE METERS

RELIANCE REGULATORS

AMERICAN BASE PRESSURE INDEXES

American 500B Ironcase Meters measure gas in this high pressure industrial installation and Base Pressure Indexes indicate the gas quantities, computed to base pressure conditions, totalized on a counter. A Reliance CBV Regulator, pilot-loaded with a Type Z Regulator, controls main pressure while a Reliance Service Regulator provides a separate connection.



AMERICAN® METER COMPANY
INCORPORATED ESTABLISHED 1836

AMERICAN METER CO. EST. 1836 MEASUREMENT ENGINEERS

GENERAL SALES OFFICE: 1513 Race Street, Philadelphia
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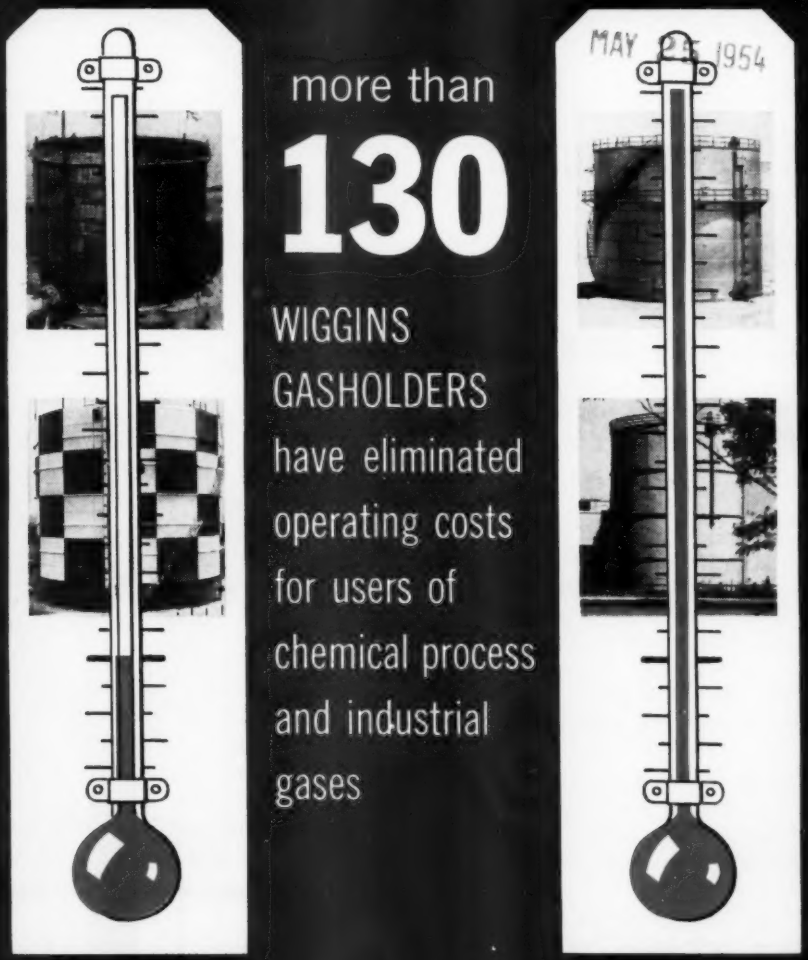
from the **ARCTIC** to the **TROPICS**



more than

130

WIGGINS GASHOLDERS have eliminated operating costs for users of chemical process and industrial gases

This 100% dry seal gasholder (no water, no tar, no grease) has proved itself under every condition of climate and temperature. Because of the seal and the simple operating mechanism, operating costs have been entirely eliminated. Comparison of maintenance expense by owners of Wiggins gasholders also shows remarkable savings. Companies who have converted old-type gasholders to the Wiggins advantages have been able to enjoy similar savings. Write for information.

PISTON RISES NEARLY TO TOP—MINIMUM OF WASTE SPACE
CAN BE BUILT ANY SIZE • NO CONTAMINATION OF GAS

1. Space above piston completely ventilated
2. Wide clearances simplify operation.
3. Gas-tight frictionless seal not affected by weather.
4. Piston rests on bottom when empty—less than ½ of 1% dead space for purging.
5. Leveling device—independent of side wall—keeps piston level.
6. Fenders prevent all tension in seal.

Wiggins Gasholder

by GENERAL AMERICAN

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GENERAL AMERICAN
TRADE MARK

General American Transportation Corporation
135 SOUTH LA SALLE STREET • CHICAGO 90, ILLINOIS

Offices in Principal Cities

Export Dept.: 380 Madison Avenue, New York 17, N. Y.
Plants: Birmingham Ala. • East Chicago, Ind. • Sharon, Pa.
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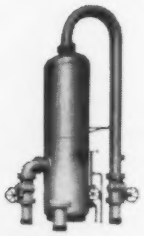
no screens to clog

no cyclones to fail

BLAW-KNOX gas cleaners immediately wash dust with oil



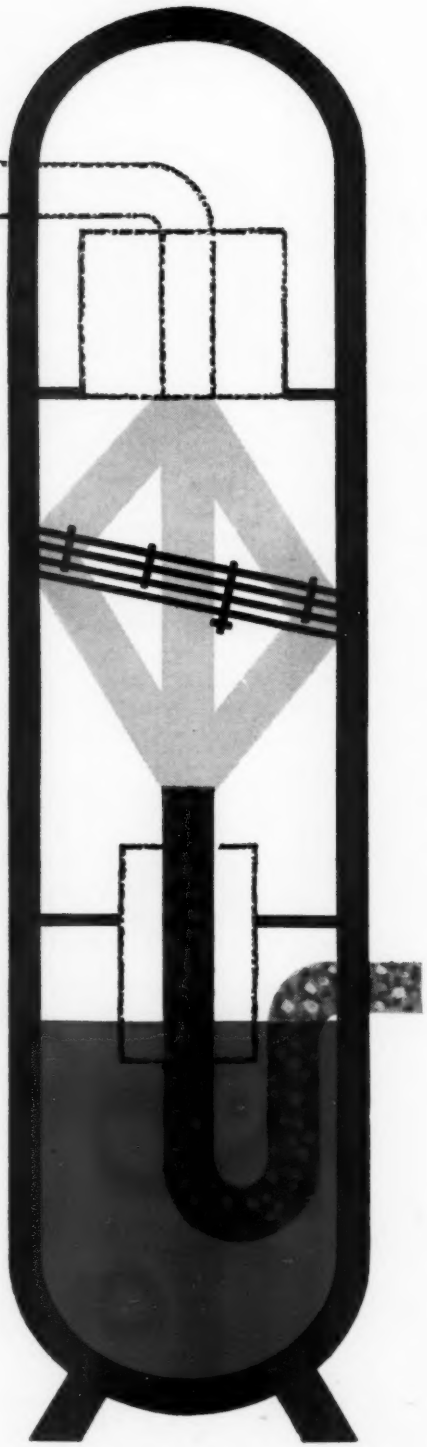
Blaw-Knox Gas Cleaners are engineered and built to remove dusts of all sizes under the most severe operating conditions with an absolute minimum of attention. There are no screens to clog or cyclones to erode and fail, reducing operating efficiency.

Immediately upon entering a Blaw-Knox Gas Cleaner, dust is violently, intimately washed with oil. The major portion of the heavier dust particles are actually scrubbed from the gas during this initial stage.

Remaining tiny wet dust particles are caught and agglomerated by a multiple baffle, primary separator. This separator is kept clean and operating at peak efficiency by continual recirculation of oil which washes particles down into a dust reservoir.

Finally, the gas flows through another expansion separation stage and into a multiple vane extractor which scrubs it clean of oil mist.

Traveling at high velocities, microscopic particles of pipeline dust sandblast regulators, compressor parts and metering devices, resulting in replacement costs, loss of revenue and customer ill will. Clean gas costs you less. So, when you buy, specify a Blaw-Knox Gas Cleaner and be sure that you're removing dusts of all sizes.



BLAW-KNOX

BLAW-KNOX COMPANY *Blaw-Knox Equipment Division*

Gas Equipment Department • Pittsburgh 38, Pennsylvania

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MAY 25 1954

AMERICAN Gas Journal
ESTABLISHED 1859

VOLUME 180 MARCH 1954 NUMBER 3

This month...

It is a pleasure indeed for AMERICAN GAS JOURNAL to announce again that the May issue will be our *Southern Gas Association Issue*. Last year, we had the first *Southern Gas Association Issue* that had ever been prepared by any gas industry publication to honor that progressive and aggressive group. Our high regard for SGA is based upon the strong allegiance of the members to the Association and the vigor of their continuing efforts and accomplishments.

• • •

Old days in the gas industry are recalled in our reestablished section on page 22. As we go through our files of AMERICAN GAS JOURNALS, from the beginnings in July 1859, we find a wealth of interest in some of the historical notes as well as the now-quaint technological information. Also, in the 25-years-ago section, we are able to recall the activities of individuals who are still a part of the gas industry or who are recalled by their former associates. We aspire to make this month-to-month feature continually interesting to gas industry historians.

• • •

To those cynics who like to engage in the deceptive arithmetic practice of dividing total proved natural gas reserves by the latest actual consumption figure in order to establish the number of years of supply that we have in the ground—we direct your attention rather emphatically to the most recent analyses of natural gas reserves on page 19. While we can not prove our contention, we have excellent and authoritative reason to believe that the latest reserve figures are most conservative.

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Bernard W. Morris · News Editor

Charles R. Bellamy · Technical Editor

Arthur Rohman · Western Editor **John F. Falvey · Financial Editor**

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TEE SERVICE CONNECTIONS

Gas service installations can be made safely, without loss of gas, by using the Mueller "E-4" Drilling Machine to install Service Tees, Curb Valve Tees and Service Valve Tees. All tees are of forged steel construction, giving excellent pressure-holding characteristics, great mechanical strength and homogeneous metal structure for welding ease and corrosion resistance.

Service Tees are available in sizes ¾" through 2" with welding or threaded inlets and welding, threaded or extended outlets. The forged steel body has adequate strength to withstand pressures of 1200 psig but is furnished, as standard, with a cast iron cap and is recommended for pressures up to 250 psig. For higher pressures use of a steel cap is recommended.

Welding outlets are used with steel service lines which allow an all-welded system. Threaded outlets are also available for steel service lines or copper service lines.

If the service line requires extreme flexibility, a compression coupling should be used with the extended outlet. These outlets are particularly adapted to sticky soils which are high in expansion and contraction, frost heave and for use under unfinished street surfaces which are subject to settling or will have heavy equipment working on them.

Insulating coupling outlets are also available.

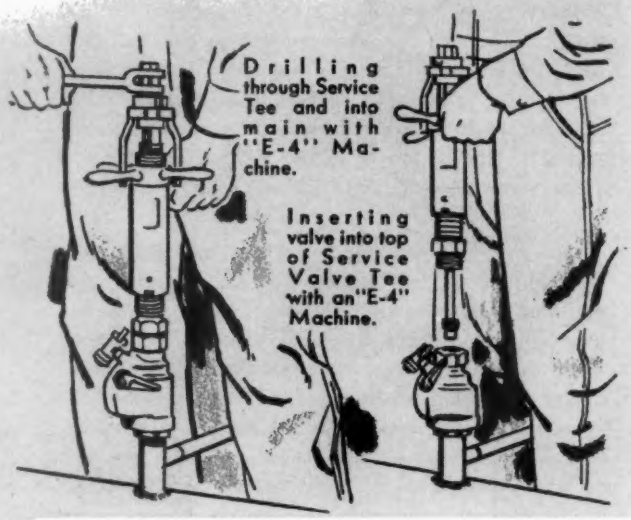
Service Valve Tees ¾" through 1¼" are similar to Service Tees but have a built-in valve to shut off service at any time without use of a machine. This tee withstands pressure up to 250 psig. The inlets and outlets described for the Service Tee are also available on Service Valve Tees.

Curb Valve Tees 1" through 2" are similar to Service Valve Tees but have a tee head on the extended valve stem which makes it possible to operate it from ground level by using a curb box and standard operating rod. They were originally designed to be used for service connections from high pressure transmission lines (farm taps), however are used extensively as a combination service connection and curb stop in the normal distribution system. They are available with the inlets and outlets described for Service Tees. Tee withstands pressure up to 1200 psig.

INSTALLING TEES

First, the tee is welded to the main, or threaded into a service clamp on the main. The service line is attached and connection is air-tested for leakage. Then, with the plug or valve removed from the tee, the "E-4" Machine is used to drill into the main. This is done under pressure and the service is put into operation, safely, without loss of gas.

Use of a Control Chamber or Gate Valve (high pressure) between the tee and the "E-4" Machine makes it possible to remove it without loss of gas. The drill is replaced with a plug-inserting tool and a plug (Service Tee) or a valve stem (Service Valve Tee or Curb Valve Tee). The "E-4" is then remounted and the plug, or stem, is screwed into the tee. To complete the installation, the Machine and Control Chamber or Gate Valve are removed and a special completion cap is screwed onto the tee to provide a double seal. In the case of the Curb Valve Tee, the tee head is also replaced.


Drilling through Service Tee and into main with "E-4" Machine.
Inserting valve into top of Service Valve Tee with an "E-4" Machine.

Safe Installation.

Wide Application.

For additional information consult your No. 55 catalo
or contact your Mueller Representative.

MUELLER CO.

Dependable Since 1857

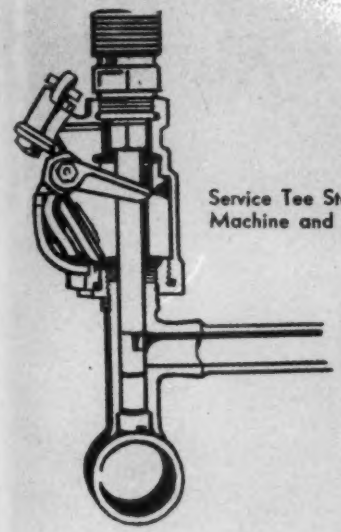
MAIN OFFICE & FACTORY DECATUR, ILLINOIS

SERVICE TEE STOP-OFFS

Stop-offs on the Service Tee may be made by using the "E-4" Machine and a steel or rubber shut-off tool. This permits repairs to be made on the service line with the gas under complete control and with perfect safety.

The rubber shut-off tool shown is attached to the boring bar of the "E-4" with a regular drillholder. The rubber portion of the tool is expanded against machined inside surface of the tee by using the feed mechanism of the "E-4" Machine, making a positive stop-off for service repairs.

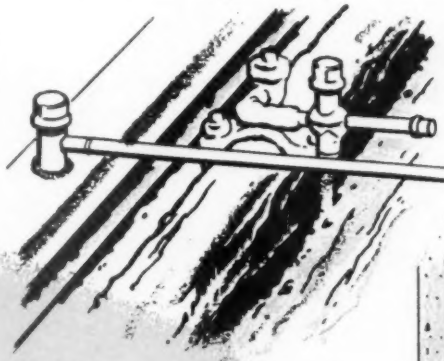
When a repair weld around the inlet or outlet of the service tee is necessary, a steel shut-off tool is used to make a perfect stop-off at the inlet of the tee.



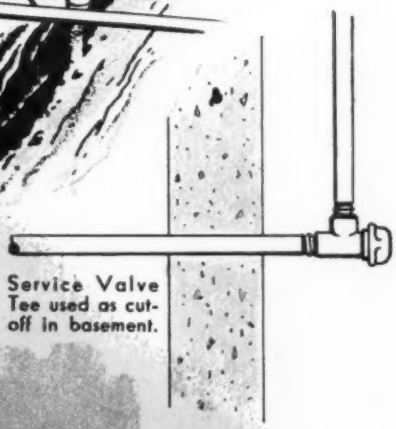
Service Tee Stop-Off with "E-4" Machine and rubber shut-off tool.

TEE APPLICATIONS

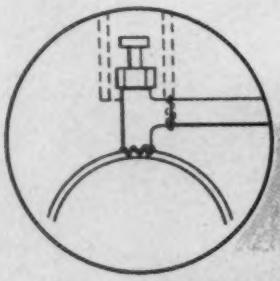
Service Tees, Service Valve Tees and Curb Valve Tees have many applications, a few of which are illustrated. When used in combination with other No-Blo products, their versatility is greatly extended. An example of this is the transfer of a service from an old main to a new main under pressure, without loss of gas or interruption of other services on the main. The setup for this transfer, using a tee connection and a Service Line Stopper Fitting, is shown.



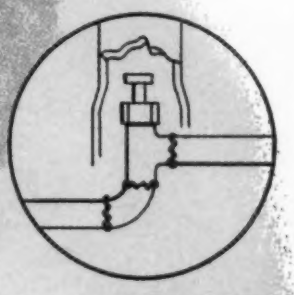
Transfer of service setup using Service Tee and Service Line Stopper Fitting.



Service Valve Tee used as cut-off in basement.



Curb Valve Tee used as a main connection with Curb Box.



Curb Valve Tee used as a Curb Stop in service line.

OF MUELLER NO-BLO FITTINGS ...with the "E-4" Drilling Machine

MAIN STOP SERVICE CONNECTIONS

Service connections with Bronze High Pressure Main Stops, ½" through 2", may be made under pressure with the "E-4" Drilling Machine by using a Service Clamp.

Service Clamps are available in single or double strap types. Single strap clamps are for a maximum of 250 psig; double strap for maximum of 500 psig. Sizes available for mains 1" through 12" in diameter. Service Clamps have tapped outlet from ½" through 2" and are available in either type.

After the Service Clamp is installed on the main and the stop is inserted with the key in open position, an "E-4" Machine with the correct adapter is screwed onto the stop. A hole is then drilled into the main through the stop, the stop is closed, the "E-4" is removed and the service line attached. A street elbow can be used to provide for expansion and contraction. Positive stop-off is insured for future repair, replacement or abandonment of service.

Installation of Main Stop with "E-4" Machine.

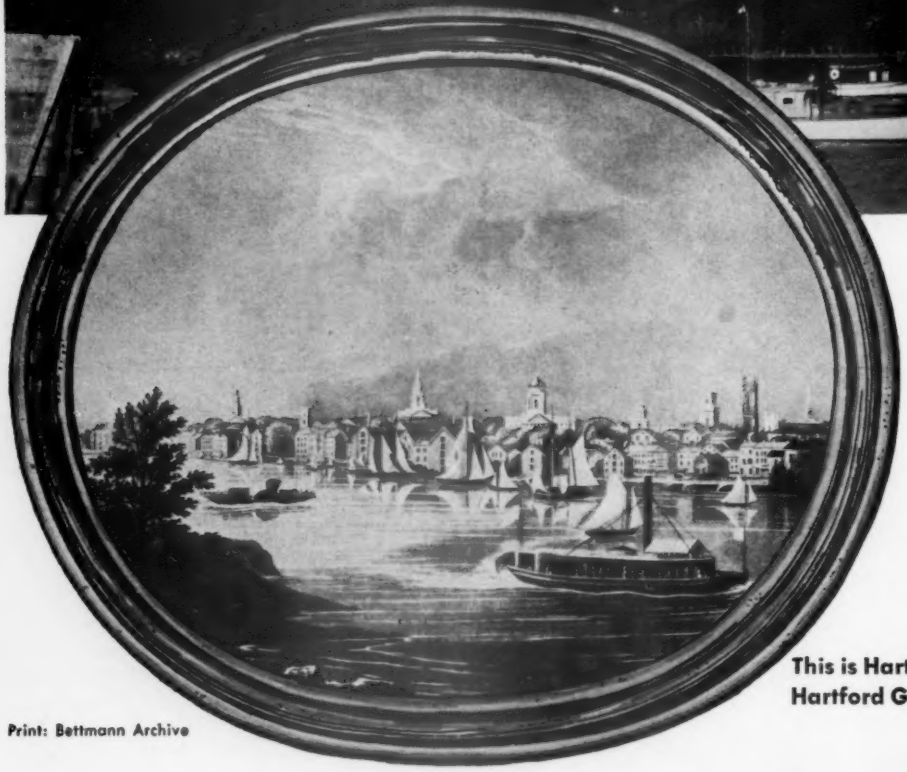
MUELLER NO-BLO Method

This is another of a series showing the broad application of Mueller No-Blo fittings and machines used for their installation.

Once a customer

Photo: Black Star

This is Hartford, Conn., the "Insurance Center of the Western Hemisphere".



Print: Bettmann Archive

This is Hartford as it looked in 1848 when Hartford Gas Company was founded.

MODERNIZED cast iron

ALWAYS a customer—generation after generation!

HARTFORD GAS COMPANY bought cast iron pipe 100 years ago—and buys it today

Hartford Gas Company (formerly Hartford City Gas Light Company) was granted its original charter in 1848. Population of Hartford was then 18,000. In 1849 cast iron distribution mains were laid. One of these mains recently was uncovered and found in good condition after 100 years' service (see cut). Today, this progressive Company is serving 67,000 customers with 535 miles of mains. It has recently completed conversion to a new 800 B.T.U. mixed gas to meet the needs of Greater Hartford's more than 300,000 population.

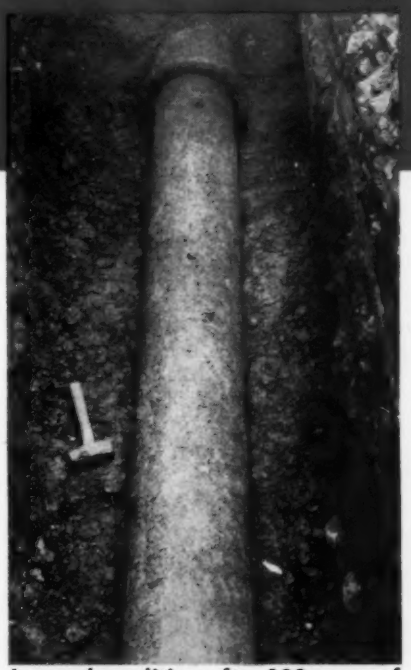
A famous jurist defined *good will* as "the probability of the customers' returning to the old stand." Hartford Gas Company has been buying cast iron pipe for more than a century. And, even though the pipe they laid in 1849 was made without benefit of engineering specifications, metallurgy and modern quality controls, some is still in service.

Today's *modernized* cast iron pipe—centrifugally cast and with standardized mechanical joints, is even more economical and efficient. The pipe is stronger, tougher, more uniform in quality. The mechanical joints are bottle-tight for usual gas pressures and for all types of gas.

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.

CAST Q IRON

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

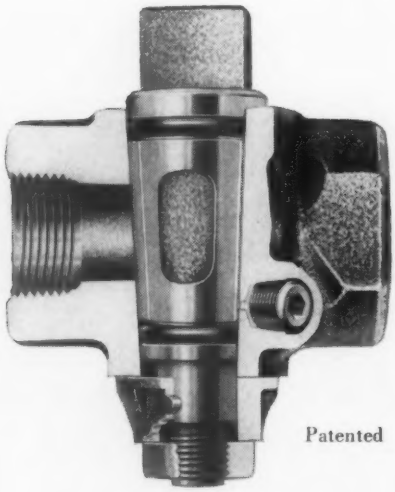


In good condition after 100 years of service, this cast iron gas main is still functioning as part of Hartford Gas Company's modern distribution system.

pipe FOR MODERN GAS DISTRIBUTION

MUELLER LubOseal® GAS STOP

fulfilling the need for a really SAFE gas meter stop



Patented

Increased demand for gas has led to higher pressures and resulted in a need for a gas meter stop that would meet the following requirements:

Should not leak at high pressure
Should retain its pressure-holding characteristics for a maximum time
Should be easily operated
Should retain its ease of operation for a maximum time
Pressure-holding characteristics and low-turning torque requirements easily renewed
Should be really tamperproof

Mueller engineers developed the LubOseal Stop which meets or surpasses all of these requirements.

It has withstood pressures up to 4800 psig without top or bottom leakage.
"O" ring seals top and bottom assure no top or bottom leakage.
"O" rings store lubricant pressure.
Lubricant under the pressure of the "O" rings is evenly distributed over *all* ground key surfaces each time the stop is operated.
Easily re-lubricated with a minimum amount of grease through independent port in body.
Tamperproof design achieved through steel drive pin in blind hole holds key in intimate contact with body even with nut removed.

Would you like to test the LubOseal Stop? We will furnish either the H-11175 Lock Wing *or* H-11170 Plain Head. Sizes ¾" through 2". *Write to Mueller Co., Dept. 36, Decatur, Illinois.*

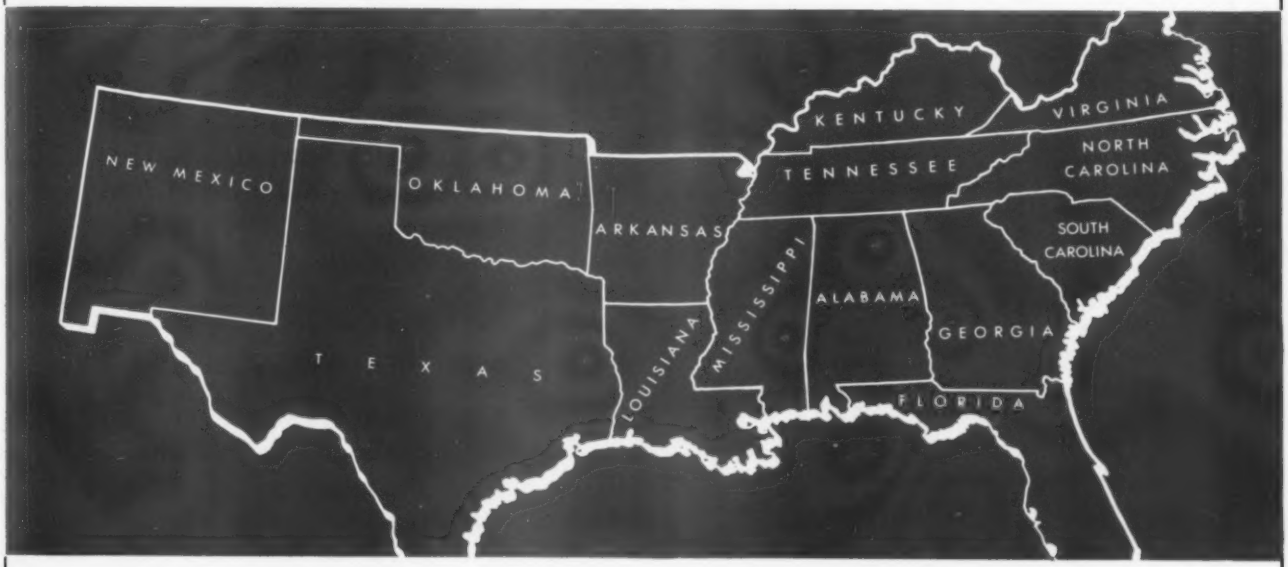
This Year, too

AMERICAN GAS JOURNAL

will have a

SOUTHERN GAS ASSOCIATION ISSUE

for initial distribution at the SGA Convention



SOUTHERN GAS ASSOCIATION'S 1953 Convention was Saluted by American Gas Journal with a special Convention issue—the first time that aggressive association was so honored by any gas industry publication.

The stimulating and highly complimentary reception accorded the 1953 issue is the firm base on which the 1954 Southern Gas Association Issue is being built. Once again, SGA officers, managing director and staff have cooperated actively in formulating the contents.

The Southern Gas Association Issue for 1954—the May issue—will be distributed initially at the SGA Convention, in Houston, April 26-28.

AMERICAN GAS JOURNAL . . . the oldest gas industry publication . . . the fastest growing gas industry publication . . . will have a total distribution of 5,600 copies of the Southern Gas Association Issue.

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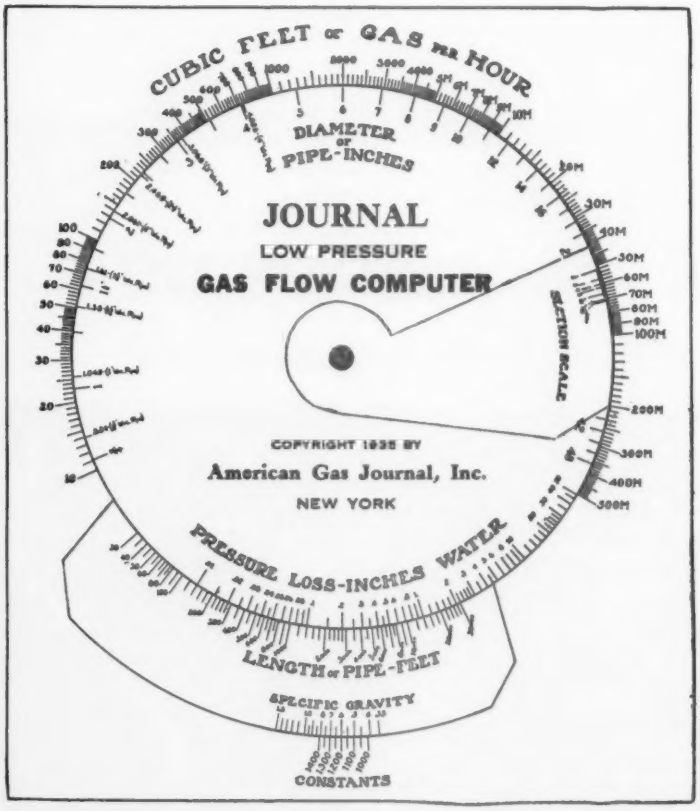

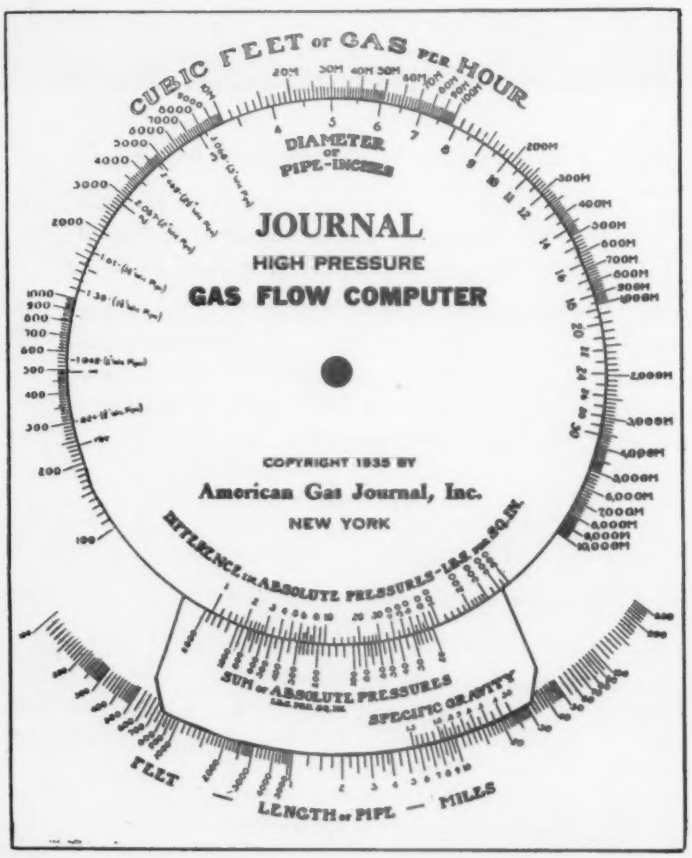

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Pressure loss (inches) . . .01 to 10
Specific gravities . . . . . 1.5 to .35
Constants . . . . . 1400 to 1000
Pipe length (feet) . . . 30 to 30,000
Price $5.00

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Cubic feet of gas per hour . . . . . 100 to 10MM
Pipe diameters . . . . . ¾" to 30"
Difference in absolute pressure to . . . . . 500 psi.
Sum of absolute pressures . . . 20 to 2,000 psi.
Specific gravities . . . . . 1.5 to .35
Pipe length (feet) . . . 100 to 5,000
Pipe length (miles) . . . . . 1 to 250
Price $5.00

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ERIE AVENUE AND D STREET PHILADELPHIA 34 PENNSYLVANIA

Modernization with Automation is the by-word of our present economy, and are a necessity for a progressive, competitive future. Automation, meaning automatic handling and processing of materials to the greatest practical degree, is an inescapable development and requirement of mass production — predicted for years as a counter-measure to rising cost and also to provide improved uniform quality by controlled production tools.

A sample production plant for a much needed metal product is now being built. The purpose is to develop a highly mechanized, modern factory, along the concept of automation, as a "standard" — to be duplicated at various locations in the U.S. about a dozen times. Production includes about seven heating and heat-treating operations of 42 tons of steel per hour, requiring, in the 12 projected plants, approximately ten billion cu. ft. of natural gas per year. At 50¢ per thousand that represents five million dollars gas revenue — or proportionately more for a justifiable higher gas rate.

BUT — the model plant is being built for electric-induction heating and heat treatment because of unreliable gas supply.

Automation must have a steady supply of all tools and materials, and fuel is as important as the steel because both are needed to make the product.

Automation of our industrial plants will proceed. If GAS wishes to be part of this economic development a review of the fuel policy towards industry assumes urgency. Maybe a "multi-billion" dollar industry can afford to neglect or disregard a mere five million annual revenue item, as involved in this sample case, but if so we wonder how often—

Frederic O. Sass
President

SELAS CORPORATION OF AMERICA
PHILADELPHIA 34, PENNSYLVANIA
Heat Processing Engineers for Industry • Development • Design • Manufacture

YOU ALWAYS Profit twice WITH SERVEL

1. **Because it sells fast and easy! Servel is different—the world's only refrigerator that makes ice "cubes" without using trays, and puts 'em in a basket—automatically! This unique new feature has given Servel the fastest-growing sales record of any refrigerator in America!**

2. **Because it keeps the gas kitchen load going up steadily! Servel refrigerators and automatic water heaters pave the way for all gas using appliances!**

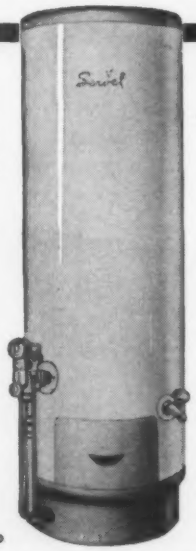
Of all the refrigerators on the market, one has captured the imagination of husbands and wives alike. Servel, the only refrigerator specifically designed for gas, is rapidly growing in popularity *and sales* coast to coast!

More, Servel appliances mean a steady, constantly increasing gas load with no peaks—and no valleys! It all adds up to a double profit every time you make a Servel sale! And the sales are there to be made!

no messy ice trays

When you pick the big, dry, supercold IceCircles out of the basket, the Servel refrigerator refills it, then turns itself off, all automatically! Large, separate freezer compartment, automatic defrost, door shelves — every deluxe feature in refrigeration today plus the miracle of ice "cubes" without trays!

CASH IN ON THE GREAT SERVEL ADVERTISING-MERCHANDISING PROGRAM FOR 1954! CONTACT YOUR SERVEL DISTRIBUTOR NOW!



Servel

The name to watch for great advances in REFRIGERATION and AIR CONDITIONING

Servel Inc., Evansville 20, Indiana
In Canada, Servel (Canada) Ltd., 548 King St. W., Toronto, Ontario

A complete line of automatic gas water heaters in sizes to fit every need. The most dependable, trouble-free water heater made.

Year-round gas air conditioning that heats as well as cools.

Editorial:

Voice Power for Gas Industry

SOMEWHERE in our past, an emphatic voice coach drilled-in the idea that "real power in the voice can be achieved only if the muscular push starts in the belly." Try it sometime—yell "Hey!" with whatever you can get out of your throat and mouth. Then, try the same "Hey!" but add the effects of the abdominal and pulmonary muscles. There's a difference.

That is not to say that public relations, publicity, press agentry or propaganda should be made up just of belly-power. We do contend that if the gas industry expects to be heard in the rowdy tumult that clamors and yammers for public attention, belly-power will have to be utilized fully. A thin voice in the wilderness will sound bird-like at the focal point—the consumer's reaction.

This page has often included the studied and experienced opinion that gas industry emphasis on public relations and on publicity are essential to the overall efforts of improving the position of the industry.

Much has been accomplished, most particularly by Gas Appliance Manufacturers Association, but there remains a vast field for further accomplishment. There are, happily, some present indication that steps might be taken in that direction. However, they are just contemplated and only as short and soft steps—not the immediate, confident and full strides that are necessary.

When GAMA embarked upon its public relation-publicity program, in May of 1951, an understandable financial-caution was evident in the budget. The idea of such a program was new to the gas industry; specific proof of effectiveness was missing. That proof of effectiveness was produced. The program was continued. A forthcoming report of the GAMA program during the past year will reveal another and very substantial gain in effectively saying good words about gas appliances—and about gas, the fuel; the two considerations can not be separated.

So—it has been *established* that a publicity-public relation program has values for the gas industry.

There must have been some such conviction within the confines of American Gas Association when the proposed 9-point public relation program was released, in January of 1953, to member-companies for study and commitments of financial support.

The financial goal set forth in the AGA presentation was not reached. The company-commitments aggregated a substantial amount and, later, practically all the participating companies indicated their readiness to make their contributions despite the shortage from the goal set for activation of the program. But—the AGA board of directors decided *not* to activate the program.

The board made a new decision, recently, to allocate from available AGA funds, a pitifully-small amount of money—nothing like the total that would have been *contributed* earlier—to be used for a public relations-publicity program. It will hardly be realistic, in any future valuation of results, to expect a naked eye to find a dent created by that allocation. The problem is too big and it is too old; the resistance is too strong. To overcome all that, a forceful impact is required—a belly-propelled voice is required.

Recent indications of an acceptance of the principle of gas industry coordination in public relation matters holds the possibility for a new and widely-beneficial approach. GAMA and AGA and Independent Natural Gas Association of America have actually sat down to talk about cooperation and coordination. That, in itself, is heartening. But, there are other indications. They relate to association-selfishness and they foretell difficulties that will hamper the early-activation of more effective programs.

Can future meetings come face-to-face with this question and reach an unqualified agreement that the dominant consideration for all concerned with coordinated efforts is to be THE GAS INDUSTRY? Then, can they agree that *united action now* is essential? Then, can they agree to really do the job, *now*, with whatever resources are available to them?

The values of effective public relation-publicity program have been widely established throughout American industry. The gas industry, while a late-comer in this method of telling its story where the story needs to be told, has proof of effectiveness within its own chambers.

The 9-point AGA public relations program of 1953 that was shelved by the board of directors merits another long and thoughtful look. The most recent board action on public relations certainly does not hold a remote possibility of dusting off that program. And, it does not make it possible for AGA to meet with other segments of the gas industry on a basis that implies real confidence in the objectives of public relations and publicity.

The abdominal and pulmonary muscles must get into the voice-power mechanism.

Pulsation Effects on Gas Measurement Outlined for Conclusive Study

by Eric J. Lindahl

Professor and Head
Mechanical Engineering Department
University of Wyoming

PULSATIVE flow has been encountered and proved bothersome for many years, and studies to determine its nature, its effects and methods of caring for it have received study over a considerable period of time. Much has been done to understand and alleviate the effects of pulsation, but much remains to be done. While pulsation can have many detrimental effects, certainly one of the most serious of these is that readings of flow-measuring devices may be rendered absolutely invalid when the meters are subjected to pulsating flow.

Early studies of pulsation were associated with the measurement of steam supplying a reciprocating steam engine. Later erroneous measurement of air at the intake of reciprocating gasoline engines caused much concern. Measurement of air from fans was found difficult at times because of pulsation. Now there exists the difficulty of measuring fuels to gas turbines. And the reciprocating compressor, with its pulsating flow and with the measurement problems it brings about, has been in use and promises to continue in use for some time to come.

At the outset it may be well to examine the nature of pulsation. When the flow is steady, that is, when the pressure and velocity remain constant at each point in the flow system, the normal energy equation can be used as the basis for determining the rate of flow through an inferential meter. However, when the flow is unsteady, that is, when there is a variation of pressure or velocity, or both, at the points of flow measurement erroneous results occur under the application of the steady flow equations. In gas systems these variations in pressure or velocity can be caused by many devices but the chief offender is the reciprocating compressor. Other causes include undamped pressure regulators, clattering valves, and liquid surging back and forth in a low portion of a line. In recent studies with measurement of liquids it has been found that mechanical vibrations in the piping system cause phenomena similar to those observed with pulsating flow of gas. Whether mechanical vibration in gas piping systems create pulsation errors is something that is not known at this moment to the knowledge of the writer.

To take a simple example of how pulsation may be produced and may affect measurement assume that pressure variations are produced by the apparatus in Figure 1 which, ideally, would produce the rectangular pressure wave shown. As shown in Figure 2, the pressures vary from h + p to h — p where p is the pulsation pressure and h is the average differential.

To give an example how pulsation of this type may affect the reading on an inferential meter, first assume that the flow measured by the meter is given by the equation $Q = K\sqrt{h}$ where Q is the measured rate of flow, K is a constant for the given meter, and h is the meter differential.

Then, for the meter subjected to pulsating flow, assume that during one period of time the actual differential is 196 units while during the next similar time interval the differential is 36 units, and that the recorder on the meter, because of its inherent inertia, indicates the average of the two actual differentials, or 116 units. The actual rate of flow will then be

$$\frac{K\sqrt{196} + K\sqrt{36}}{2} = 10K$$

and at the same time the instrument will indicate a flow of

$$K\sqrt{\frac{196 + 36}{2}} = 10.77K.$$

This meter under pulsating flow then gives a reading which is

$$\frac{10.77K - 10K}{10K} \times 100 = 7.7\%$$

greater than actual flow.

The foregoing discussion simplifies very much how pulsation causes erroneous meter readings but does give an indication why pulsation should not be tolerated. While the sample calculation just shown indicates an error of 7.7%, the actual error in a meter reading due to pulsation may run into hundreds of percent. In passing it should be pointed out that ideal rectangular, triangular and sine waves have been analyzed for the maximum error which each can produce. It was found that the maximum error of approximately 40% was found in the rectangular wave and since actual meter errors can be much greater than this perhaps it might be concluded that the actual pulsation waves are anything but regular. At least, this has been found to be the case in some instances where the shape of actual waves has been determined. Then, too, phenomena besides pressure variations enter into pulsation.

Some of the early studies were concerned with the nature of pulsation and a

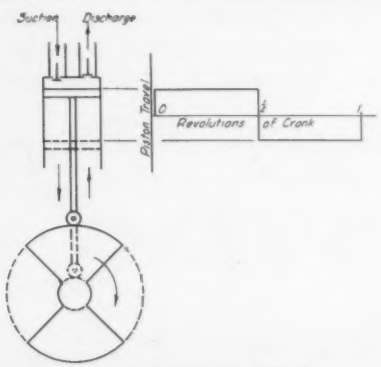
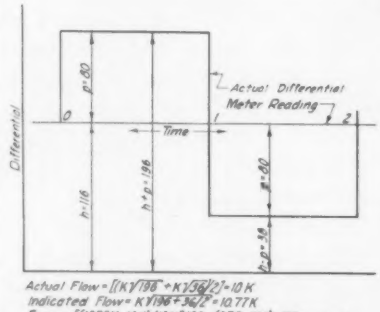


Figure 1—Compressor pulsation



Actual Flow = $[(K\sqrt{196} + K\sqrt{36})/2] = 10K$
Indicated Flow = $K\sqrt{\frac{196+36}{2}} = 10.77K$
Error = $[(10.77K - 10K)/10K] \times 100 = (.077 \times 100) = 7.7$ percent

Figure 2—Rectangular pulsation wave

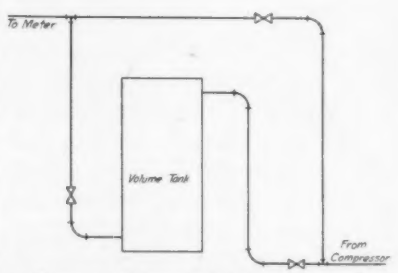


Figure 3—Volume-tank test arrangement

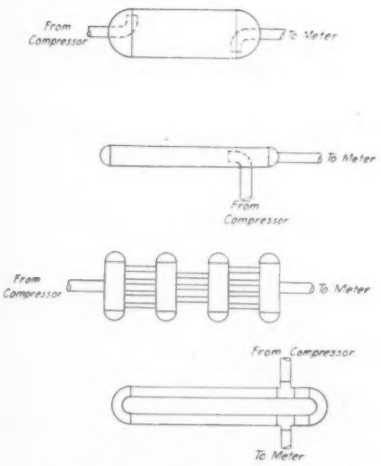


Figure 4—Pulsation eliminators

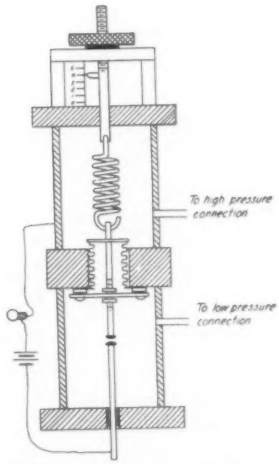


Figure 5—Mechanical pulsameter

few theoretical investigations were made. For instance, it was found that for a given rate of flow the error due to pulsation was decreased if a smaller orifice was used and the differential was increased thereby. Another early study shows that restrictions placed in gage lines increased the meter error rather than decreasing it.

The study using the test set-up shown in Figure 3 and similar studies indicated that a volume placed in the line would tend to absorb pulsation. In this test the piping was arranged in such a way that the system could be operated both with and without the tank.

Other devices, a few of which are shown in Figure 4, have been utilized and minimize pulsation to a greater or less degree.

Apparently any volume or anything that will produce a pressure drop when placed between the source of pulsation and the meter will tend to minimize the error due to pulsation. A pipe between the two, if of some length, should eliminate pulsation and while it no doubt does in many instances there have been cases where lines of considerable length have not erased the pulsation.

While volume tanks placed between the source of pulsation and the meter have proved successful, in some cases at least, but for some installations they would prove impractical because of the huge sizes that would be required. Commercially-developed eliminators have proved successful and practical for the capacities and operating conditions for which they were designed but have been reported less successful when subjected to other than design conditions.

Restrictions consisting of a plate with single or multiple holes or perhaps merely a "pinched" valve placed between the offending pulsation-producer and the meter conceivably might reduce the pulsation to the point where it is no longer serious. However, it appears that the determination of quantity of "pinching" or the optimum number and size of holes in a restrictive plate is largely a matter of trial and error at the present time.

One device for determining whether or not pulsation exists is the Beitler-Overbeck mechanical pulsameter, shown in Figure 5, used to determine the sum of the normal differential and the height of the peak of the pressure wave. Electronic devices have also been developed for detecting the presence of pulsation. In the mechanical device, the reading from the instrument is compared with the differential indicated on the meter chart and from these two values a determination can be made which will indicate if the pulsation error is less than or greater than 1%. This determination is made by the use of the curve in Figure 6, which was established by tests using an experimental test set-up handling natural gas. The set-up consisted of two meters in series. One meter and the pulsameter were subjected to pulsation while the other meter had steady flow produced by considerable "pinching" of a plug cock placed between the two meters. The second meter thus gave true flow readings while the former gave erroneous readings and the extent of the error due to pulsation was determined. The line in Figure 5 was drawn through the 1% points which were determined by experiment.

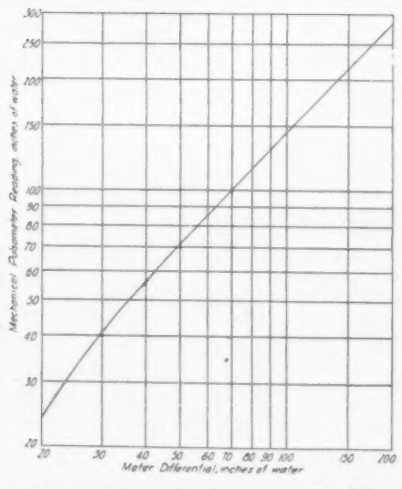


Figure 6—Relationship between meter differential and pulsameter reading for 1% error

While formerly most investigations regarding pulsation seem to have been largely of the "field" type, some of the most recent studies have consisted of mathematical analyses of the nature of pulsation and a little experimental work of a laboratory nature has been carried on. Most of the recent experimental work has not dealt with natural gas but any conclusions which can be drawn from any studies of pulsation should be of interest and prove applicable to the natural gas industry. Nor has much recent experimental work been directed solely toward the solution of pulsation problems. Pulsation studies, however, have crept in and been incidental to other experimental work.

There is a general feeling that special attention should be given to each of the variables present in a meter subjected to pulsating flow such as quantity of flow, frequency of pulsation, amplitude of the pulsation wave, the wave form, the diameter ration, the meter differential and perhaps others. It would be determined which of these have a marked effect on the meter accuracy and which do not.

A study that could well be carried on in the laboratory, is the one which would check the 1% curve used with mechanical pulsameter and to establish the precise location of this curve in the region of low differentials. While the 1% curve for this instrument was determined in a set-up designed specifically for this study it was not possible to change all the variables and the instrument should be given a thorough check by changing all possible conditions. At the risk of being overly optimistic, the statement is ventured that this instrument might be used for determining the magnitude of the pulsation error if sufficient studies were carried out with the instrument operating under such conditions as various frequencies, wave forms and amplitude.

Some studies should be made with pulsating liquids. While the matter of pulsating liquids probably does not concern people who deal exclusively with natural gas, nevertheless, some laws governing pulsating flow may be discovered which could be carried over into pulsating gas flows. Actually tests made with liquids or vapors may be easier to conduct and the accuracy may be greater than tests conducted with gases since vapors, after being condensed, and liquids can be weighed to determine the true rates of flow.

Further studies for both gases and liquids should be undertaken with mechanical vibrations introduced into the piping system.

A feeling exists that eventually codes should be formulated which would define the maximum amount of pulsation permissible which would still permit accurate measurement with the aid of inferential meters. So far, there exists only the feeling that measurement with primary elements should not be undertaken if pulsation is present and that pulsations can be suppressed by capacity and resistance placed between the source of pulsation and the meter. At present, no general rule

(Continued on page 34)

Newly Developed Principles of Domestic Range Equipment Presented to Industry

by Hilding H. Carlson

THE new principles of design, construction and operation for gas range equipment that were demonstrated to executives and other representatives of utility and appliance-manufacturing companies at the Cleveland Laboratories of American Gas Association were represented in the actual working models developed at the Laboratories. Walter B. Kirk, chief AGA research engineer, pointed out that they were subject to further improvements in their specific application.

"But, we feel they illustrate the practicability of providing several highly-desirable features on gas ranges," he said. "We also feel that they should provide a sufficient basis for triggering industry-wide range development and sales programs without further delay."

The demonstrations, sponsored jointly by the PAR committee and the Gas Industry Development committee, were a new approach to the problems involved in advancing and promoting gas appliance features that may have consumer-attractions.

"If enough gas company representatives and manufacturers of ranges and accessories are sufficiently interested in this show to initiate action, then others will follow," Mr. Kirk emphasized.

The demonstrations were not to be regarded as a revival meeting, he said, "but if we'll take our coats off for further efforts in this direction, we'll soon have a story to tell the great American public in the shape of better gas ranges."

THE SECOND OF TWO ARTICLES ON THE DEMONSTRATIONS OF NEW DOMESTIC GAS RANGE EQUIPMENT AT THE LABORATORIES OF AMERICAN GAS ASSOCIATION

The first article was included in the February issue.

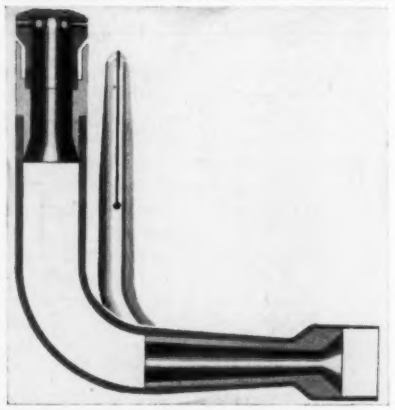
THE NICKEL-SIZED BURNER is under discussion here, with Earl H. Eacker, AGA president, right, holding the subject while Walter B. Kirk listens with pardonable-pride.

[Some of the observations and performances during the Cleveland demonstrations of burners, pilots, valves, an oven and a broiler were included in the February issue of American Gas Journal. Others are presented here.]

STEAK-CUTTING by Miss Patricia A. Speidel at the gas range research demonstration. Walter B. Kirk, chief research engineer of the AGA Laboratories, left, watches with understandable-anticipation. The golden glow broiler, shown at the extreme right, "processed" the steak to the usual-turn. This is an overall view of the demonstration.

Nickel-sized burner

Input (Btu/hr)	*Efficiency (per cent)*
9,000	50.0
6,600	58.0
16,000	36.5



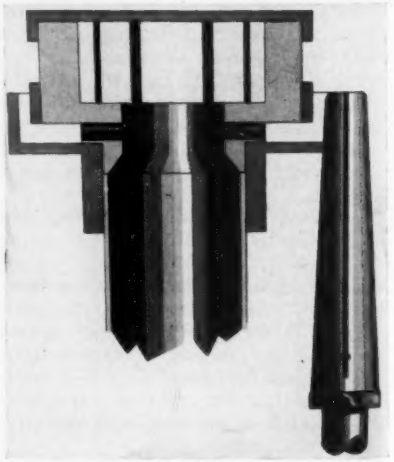
Nickel-sized burner

Turndown to approximately 350 Btu/hr; burns city, LP-air gases; it has no air shutter; and is equipped with a 50 Btu/hr pilot.

A single-duty valve with precision heat control and by-pass tube connected to burner ignition port gives reliable and instantaneous ignition or reignition at any heat setting.

Slot port burner

Input (Btu/hr)	*Efficiency (per cent)*
9,000	49.2



Slot port burner

Turndown to approximately 350 Btu/hr; also burns city, LP-air and LP gases; it has a 50 Btu/hr pilot but does not have an air shutter.

A double-duty valve with a low heat side is connected to burner ignition port for reliable and instantaneous ignition or reignition at any heat setting.

Top pilots

The two pilots which light the two new burners are identical. They were developed as low Btu type pilots to meet the objective of an essentially cold range with fast, reliable ignition. With this type of pilot, it is possible to use one for each burner and eliminate the slight time lag or possible mechanical defects of a flash tube.

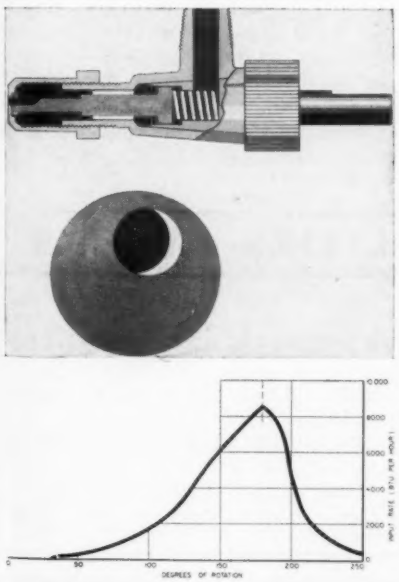
They are stainless steel hypodermic needles and consume less than 50 Btu per hour. They do not require primary air and are insensitive to gas pressure changes. Their construction protects them from drafts and spill-overs.

Another ignition system, of new and improved design, to provide for a cooler top section and less heat loss to the kitchen, was shown. A common pilot for two burners operated in conjunction with short flash tubes to ignite the front and rear burners. With an input rating of about 100 Btu per hour on natural gas, this pilot operates satisfactorily at any gas pressure between 1¼ and ½ normal test pressure. The pilot and flash tubes do not require primary air.

Valves

The single-duty type valve with two off-center orifices rotating past each other give full heat when orifices are matched. Effective valve turning for heat control is over 250 degrees.

VARIABLE ORIFICE VALVE

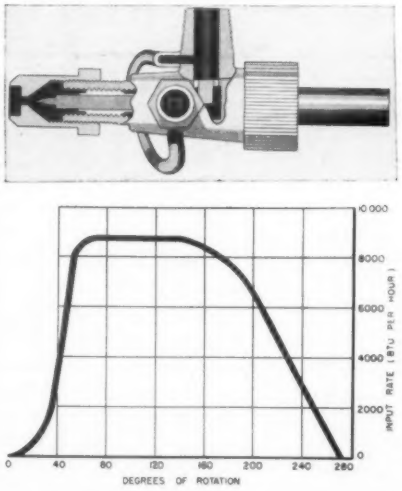


Performance of the variable orifice valve is shown in the accompanying graph.

The single-duty type valve with altered movable tapered pin and threads has a by-pass tube that supplies gas directly to burner ignition port as soon as valve is turned on. Effective valve turning for heat control is over 200 degrees.

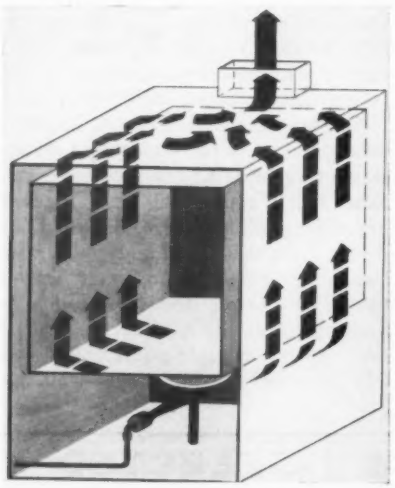
Performance of the traveling-pin valve is shown in the accompanying graph.

TRAVELING-PIN VALVE WITH BY PASS

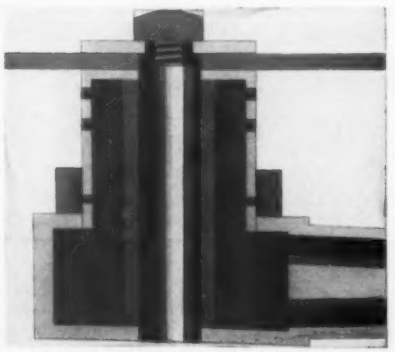


Muffle-type oven

This muffle-type oven is heated by the passage of hot gases from the burner upward around the sides and back, and across the top of the oven compartment. No combustion products enter the oven baking compartment.



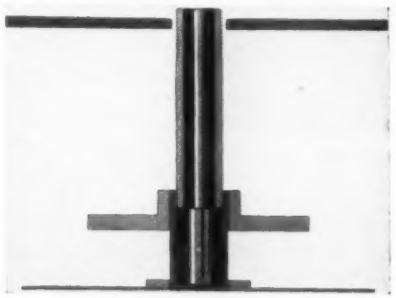
Muffle-type oven



Low-heat oven burner

Broiling compartment

A new or little-used element was introduced by the Laboratories in broiling with a golden flame burner.



Radiant-flame broiler burner

Burner-to-grate distance

The possibility was investigated of simultaneously reducing the nominal rate and grate height to effect an increase in thermal efficiency and thus a decrease in heat loss to the kitchen while maintaining approximately the same speed of operation. With one burner operated at an input rate of 9,000 Btu per hour with a grate height of ⅝", a standard thermal efficiency of 51% was obtained. Heat loss to the kitchen during 10 minutes, 5 seconds of operation was 735 Btu. In order to maintain the same speed of heating at 6,000 Btu per hour (the rate at which the burner approaches maximum efficiency), it was calculated that a thermal efficiency of 75% is required. The heat loss in this instance would approximate 250 Btu for the operation. Similarly, an efficiency of 65% and a heat loss of only 400 Btu are required at 7,000 Btu per hour.

Experimentally, decreasing the grate height to ⅜" and the nominal input to 6,600 Btu per hour yielded an efficiency of 58% and a heat loss of 540 Btu for an 11 minutes, 50 seconds period. Thus, efficiency and time required increased by 14 and 18%, respectively, while heat loss decreased by 26½%.

Reducing the rate to 5,600 Btu per hour while maintaining the ⅜" grate height increased efficiency to 61.2% and the time required for the operation to 13 minutes, 6 seconds, an increase of 30%. Heat loss during this period decreased by 33% to 470 Btu. Had this burner originally been mounted so as to just meet present approval requirements, decreasing grate height and nominal rates would have proved far more effective.

In a further step, a conventional burner was considered. It was rated at 9,000 Btu per hour, bordering on the standard requirement of 40% efficiency. It will take roughly 12 minutes to accomplish the task set forth in the approval requirements, and will liberate approximately 1,100 Btu to the kitchen. If this speed is satisfactory to the customer, then it would be very easy

(Continued on page 33)

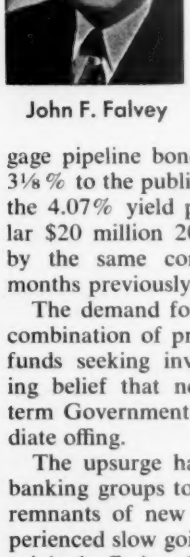
Bond Market At New Three-Year High

No Reversal of the Trend Seems in Early Prospect

by John F. Falvey

Financial Editor

THE corporate bond market recently has been fulfilling the most optimistic predictions, with double A rated obligations heading below a three % yield for the first time in three years.



John F. Falvey

How great has been the improvement is shown in the experience of Southern Natural Gas Company which has just sold $20 million of 20-year first mortgage pipeline bonds at a price to yield 3⅛% to the public. This compares with the 4.07% yield provided from a similar $20 million 20-year issue marketed by the same company less than 10 months previously.

The demand for corporates reflects a combination of pressure of institutional funds seeking investment and increasing belief that no large-volume, long-term Government issue is in the immediate offing.

The upsurge has enabled investment banking groups to clear their shelves of remnants of new issues which had experienced slow going at the time of their original offering. Investors, in fact, now are beginning to nibble at two-year old distilling company obligations which still are in the hands of the underwriters.

Even prior to sale recently of the Houston Lighting & Power Company $30 million of 3s to yield 2.90%, bank sources had indicated interest in AA rates utility bonds at a yield base of 2.87%.

Judging from the tenor of the market, the yields might well go below this level by the time this issue goes to press.

The bank interest evidenced in high grade utility issues coincides with the belief expressed by Roy L. Reierson, vice president of Bankers Trust Company of New York, at the recent meeting of the Annual Savings Bank Conference, that underlying economic pressures will operate in the direction of further reduction in bond yields. In their decline during recent months, bond yields have anticipated to some extent the change in investment psychology now taking place but, unless business conditions deteriorate more than now is expected, further declines of a more modest nature seem to be in prospect for the months ahead.

Mr. Reierson based his belief upon the likelihood that demands for investment funds would decline somewhat more than new savings in 1954; that only state and local governments would exceed or equal their 1953 borrowings this year; that the Treasury's new money requirements are likely to be no larger in 1954 than in 1953; and that new issues of corporate bonds and stocks may be significantly lower than a year ago.

During recent weeks, it might be mentioned, bids for bonds sold through competitive bidding channels were made "ahead of the market," with prices being stipulated which would yield anywhere from four to eight basis points less than normally would have been expected to prevail under economic and investment conditions existing at the time the bonds were offered. Following this the steady decline in interest rates carried prices for the bonds into line with market conditions, with the result that all of the issues bid for on that basis were distributed to the public at a profit for the investment banking underwriters who won the issues.

At least two public utility companies which sold new bond issues at high cost during the unsettled bond market which existed during the early spring of 1953 have refunded, or are about to refund, the obligations which they sold at that time. Over the life of the issues considerable interest saving could be effected; and if the market continues along the favorable course on which it has been embarked during the past several months, many more refunding programs should be coming along. In fact, a number of public utility companies' boards of directors now are actually in the process of studying the possible interest savings which they might effect by refunding and are closely watching the market for a clue as to when best to take such action.

In their declining trend interest rates have been reflecting stimulus imparted by the Federal Reserve System action in reducing the rediscount rate recently from two % to one and three-quarters %. In so doing the Reserve has gone contra to the hope expressed in a number of financial quarters that the Administration currently would utilize its powers to hold interest rates to a stable

(Continued on page 32)

INDEX OF YIELDS : SELECTED UTILITIES STOCKS

	Feb. 1954	Jan. 1954	Dec. 1953	Nov. 1953	Oct. 1953	Sept. 1953	Aug. 1953	July 1953	June 1953	May 1953	Apr. 1953	Mar. 1953
Natural Gas Transmission Companies	4.25%	4.21%	4.39%	4.44%	4.44%	4.90%	4.46%	4.76%	4.72%	4.34%	4.18%	4.04%
Natural Gas Transmission & Distribution Companies	5.39	5.39	5.54	5.49	5.58	5.74	5.13	5.41	5.55	5.28	5.06	4.91
Manufactured & Mixed Gas Companies	4.66	4.66	4.91	4.75	4.94	5.14	4.99	5.06	5.08	4.80	4.73	4.63
Class "A" Electric Companies	4.92	4.92	5.10	5.15	5.14	5.41	5.27	5.41	5.53	5.18	5.14	4.97
Class "B" Electric Companies	5.01	5.14	5.23	5.14	5.37	5.61	5.50	5.41	5.68	5.35	5.06	4.93

This is a straight arithmetical index of comparative yields obtainable on a selected group of gas and electric utility industry common stocks.

The companies comprising this index have been selected by the AMERICAN GAS JOURNAL as providing a representative cross-section of each industry, from the standpoint of geographical diversification and of the relative importance of the individual companies in their areas.

No effort has been made to weight the average to give effect to changes in capitalization or in dividend rates because the yields afforded on the issues reflect such changes. The index is designed to show the rate of return and not necessarily market movements on the stocks comprising it.

This index is compiled from: natural gas transmission companies, 5; natural gas transmission and distribution companies, 5; manufactured and mixed gas companies, 4; class "A" electric companies, 4; class "B" electric companies, 5.

Natural Gas Reserves Up 5.5%—Production Up 6%

PROVED recoverable natural gas reserves in the United States on December 31, 1953, totaled 211.4 trillion cubic feet, an increase of 11.7 trillion cubic feet over reserves of 199.7 trillion cubic feet a year earlier, according to a joint report of the committee on reserves of American Gas Association and American Petroleum Institute. These reserves achieved a new record high level after an all-time high in production of 9.2 trillion cubic feet in 1953. The previous record production was 8.6 trillion cubic feet in 1952.

The AGA committee on natural gas reserves estimated proved recoverable reserves of natural gas liquids on December 31, 1953, were up to a record level of 5.4 billion barrels. The previous high of 5.0 billion barrels was at the end of 1952. This increase was registered despite a record production of 303 million barrels of liquids last year.

More new discoveries

The discovery of 7.1 trillion cubic feet of new reserves in 1953 compared with 5.4 trillion of reserves in new fields brought in during 1952, emphasized the importance of exploration activities to meet the increasing demand.

Further exploration and drilling in existing fields added 13.4 trillion cubic feet to the reserves. Nearly 516 billion cubic feet of natural gas were added to estimated reserves in underground storage at the end of 1953.

New natural gas reserves discovered in 1953, plus the extensions and revisions of the previous estimate, totaled 20.4 billion cubic feet. That expansion exceeded the total production by 122%.

In 1952, the reserves expansion—newly discovered reserves, plus extensions and revisions of the 1951-estimate—showed a margin of 64% over the total production.

The 211.4 trillion cubic feet of recoverable natural gas reserves in 1953 registers a 5.5% increase over the reserves estimate of 199.7 trillion cubic feet a year earlier. The latest production total of 9.2 trillion cubic feet for natural gas is 6% higher than the 1952-total of 8.6 trillion cubic feet.

The committee

The AGA-API committee on natural gas reserves included: N. C. McGowen *(chairman)*, United Gas Corp.; R. M. Bauer, Southern California Gas Co.; E. A. Brown, Lone Star Gas Co.; R. O. Garrett, Arkansas Louisiana Gas Co.; B. B. Gibbs, Union Producing Co.; C. C. Hoffman, Cities Service Gas Co.; F. S. Lott, Petroleum Administration for Defense; E. D. Pressler, Humble Oil and Refining Co.; E. E. Roth, Columbia Gas System Service Corp.; James Royds, Continental Oil Co.; J. T. Scopes, Union Producing Co.; C. E. Turner, Phillips Petroleum Co.; Warall J. N. Whipple, Southern Natural Gas Co.; O. E. Zwanzig *(secretary)*, AGA.

STATISTICS FROM AMERICAN GAS ASSOCIATION REPORT ON NATURAL GAS RESERVES

SUMMARY

Natural Gas Reserves and Production

(000,000 cubic feet)

	Dec. 31, 1953	Dec. 31, 1952	1952-1953
RESERVES, NATURAL GAS	211,447,132	199,716,225	+11,730,907
	1953	1952	1952-1953
PRODUCTION,* NATURAL GAS	9,238,540	8,639,638	+598,902

Natural Gas Liquids Reserves and Production

(000 bbl, 42 gallons)

	Dec. 31, 1953	Dec. 31, 1952	1952-1953
RESERVES, NATURAL GAS LIQUIDS	5,437,922	4,996,651	+441,271
	1953	1952	1953-1952
PRODUCTION, NATURAL GAS LIQUIDS	302,698	284,789	+17,909

Natural Gas Reserves

(000,000 cubic feet)

Total proved reserves, December 31, 1952		199,716,225
Extensions and revisions of previous estimate	13,371,355	
New reserves discovered in 1953	7,081,661	
Net changes in "stored gas" during 1953	516,431	
Total proved reserves added and net changes in "stored gas" during 1953		20,969,447
Total proved reserves, December 31, 1952, and additions during 1953		220,685,672
Deduct production* during 1953		9,238,540
TOTAL PROVED RESERVES, DECEMBER 31, 1953		211,447,132

Natural Gas Liquids Reserves

(000 bbl, 42 U. S. gallons)

Total proved reserves, December 31, 1952		4,996,651
Extensions and revisions of previous estimate	648,047	
New reserves discovered in 1953	95,922	
Total proved reserves added in 1953		743,969
Total proved reserves, December 31, 1952, and new proved reserves added in 1953		5,740,620
Deduct production during 1953		302,698
TOTAL PROVED RESERVES, DECEMBER 31, 1953		5,437,922

* 1953 figures are net after deducting gas returned to reservoirs for cycling and pressure maintenance.

Patent Validity and Infringement Laws Altered in Recent Cases

by Leo T. Parker
Attorney at Law
Cincinnati, Ohio

DURING a recent meeting with gas company officials and employees the following problem was raised: "Under what rule of law can an employee of a gas company have complete ownership of a patent on an invention he conceived and perfected?" Other legal questions were asked which related to validity of patent, infringement, ownership and royalty contracts.

The courts have rendered many decisions pertaining to patent ownership and while the majority of these relate to ordinary litigations a few of the controversies involve unusual and extraordinary circumstances. Since neither gas company officials nor employees are ordinarily prepared to combat suits involving ownership of patents, a review of a few interesting litigations may offer some information that may be utilized in the future to good advantage.

Ownership of patents

Until recently, the courts held that an inventor was always the sole owner of a patent applied for and issued in his name, even though the invention was perfected on his employer's time and with the use of his employer's equipment and tools. See (119 U. S. 226).

However, the new patent law is different. A recent Supreme Court decision over-ruled the old decisions and established the present law which holds that if a patent is granted in the name of an employee and the patent is on an invention conceived and perfected on his employer's time, while he was being paid for inventive work, the employer is the legal owner of the patent.

Of course, convincing testimony must be introduced before a court will issue an order requesting the Patent Office to transfer the title of an application, or already issued patent, from the name of the inventor to the employer. Records show that until recently decisions involving ownership of patents have been in favor of the employees. Therefore, it is apparent that from this standpoint the "hearsay" knowledge of law on this subject is well founded but, at present, completely over-ruled.

The legality of this old law held that although an employee was paid to perfect improvements, the employee owned all patents obtained for inventions that he perfected while in the employer's employ.

The Supreme Court of the United States in Parts v. Peck, 264 U. S. 53 changed the old law so that today a gas company's employee who perfects an invention in his employer's plant, or while being paid by his employer, has no legal interest in the patent.

Hence, at present a gas company's employee who is hired to improve or perfect equipment, and who obtains a patent, cannot hold it because the company can sue and have the court assign the patent to the company.

On the other hand, the employee has a full interest and ownership in the invention if he proves that it was perfected while he was off duty or while he was not being paid by his employer. Obviously, if the employee perfects the invention at his home the employer has no interest in the invention, providing no contract exists in which the employee agrees to assign to his employer all inventions relevant to his employer's business.

For example, in Application of O'Keefe, 202 Fed. (2d) 767, it was shown that a gas company's employee named O'Keefe perfected an invention, at night and on Saturdays and Sundays while at his own home.

O'Keefe invented a simple deflector which causes hot gases issuing for the top of an oven door to be directed clear of the control knobs so that the knobs remain cool.

The examiner in the Patent Office refused to award a patent to O'Keefe on the contention that the invention was so simple that no invention was involved. The United States Court of Customs and Patent Appeals reversed the examiner's decision and allowed O'Keefe a patent, saying:

"Invention may be involved by a change in proportion of critical elements of an operating device." Since O'Keefe had perfected the invention in his own time, the patent will issue in his name without his employer having any interest in the patent.

According to a new court decision: If an employee is hired to devise, perfect or improve inventions, he cannot, after successfully accomplishing the work for which he was employed, obtain a patent in his own name. Whatever rights as an individual he may have had, he has sold them in advance to his employer, who pays for his time, work and effort. See Marcalus Company, Inc. v. Sullivan, 60 Atl. (2d) 330. In this case the court decided that the employer owned the patent because Sullivan, the employee, perfected it while being paid by the employer.

Validity of agreements

Various courts have held that a gas company may have exclusive ownership of all patents obtained by an employee if he signs a contract in which he agrees to assign all patents to the employer which are obtained while he is in the company's employ. Under a contract of this nature the employer may claim ownership to all inventions of the employee, although the latter perfected them at his home, or while off duty.

For many years it has been customary for employers, who employ workmen to make improvements, to provide written agreements wherein employees agree to assign all of their patent rights to the employer on inventions made while working on the employer's time. Under the old law such a contract was necessary so that employers received the benefits of the inventive ability of their employees, even though the inventors actually were paid to design and invent new things. And these contracts were held to be valid.

Today, a signed contract in which an employee agrees to assign to his employer inventions made, while on or off duty, are valid under certain circumstances. In order that a contract of this nature be valid the employer must prove that the "consideration" on his part was that of giving the employee employment at stated wages; otherwise the agreement is void.

In a late court case it was shown that a gas company's employee had been in the company's employ for several years. He was approached by a company official and requested to sign an agreement to assign to the company all patents for inventions which he might in the future perfect relating to the sale and distribution of gas. The employee signed the agreement.

Later, while off duty, he conceived an idea for a gas distribution system. He applied for and received a patent. In subsequent litigation the court held that the company had no interest or ownership in the patent because the employee had perfected the invention on his own time and, second, the contract in which the employee had agreed to assign all patents to the company was void.

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Natural Gas Transmission Through Interconnected Pipelines Is Urged

INTERCONNECTIONS between companies whose lines comprise the nation's natural gas pipeline systems are most desirable in the public and private interests. This opinion was expressed today by Carl T. Kallina, chief, division of gas certificates, Federal Power Commission. The FPC official told delegates at a Natural Gas Supply, Transmission and Storage Conference sponsored by American Gas Association at New Orleans, early this month, that while he was voicing his own opinion, the Commission had taken the same attitude on different occasions.

In its annual report to Congress for 1952, the Commission recommended legislative action be taken to require natural gas companies to interconnect their facilities voluntarily or otherwise, on a permanent basis for emergency use. Such emergency use need not be restricted to unforeseen circumstances requiring immediate action, Mr. Kallina said, but could include taking advantage of unforeseen economic benefits.

In the 1952 Annual Report to the Congress of the United States, the commission made certain legislative recommendations. Two of these clearly point out the attitude of the commission itself towards the desirability of emergency interconnections.

"(1) *Natural Gas Act—Emergency Interconnections.*—It is recommended that a new subsection (i) be added to Section 7 of the Natural Gas Act giving authority to the commission, similar to that conferred by Section 202 of the Federal Power Act, to require natural gas companies to interconnect their facilities with others engaged in the sale and distribution of natural gas and to sell or exchange gas with such persons, together with authority to prescribe the terms, arrangements, and conditions for such interconnections and the compensation payable therefor.

"(2) *Natural Gas Act—Voluntary Interconnections.*—It is recommended that a new subsection (j) be added to Section 7 of the Natural Gas Act permitting voluntary interconnections of natural-gas facilities and their maintenance on a permanent basis for emergency use upon authorization by the commission, and under such circumstances conferring a jurisdictional exemption. Such a provision is now contained in Section 202 (d) of the Federal Power Act."

. . . the use of the term 'emergency' . . . is not limited to the strict sense of the word implying only unforseen circumstances requiring immediate action, such as a line break or other physical failure. 'Emergency' . . . is also used as implying measures for taking advantage of unforeseen economic benefits and most important as a part of a general plan of cooperative operation for meeting situations involving expected but extraordinary circumstances.

. . . prices are on the rise both in cost of new gas purchased as well as in construction and operation of pipelines, and market demands generally exceed the ability of the industry fully to meet all demands.

Service during interruptions

The nightmares of gas distributing companies are bound to include . . . the probability of consumer outages due to discontinuance of supply. Every distribution system of consequence takes every precaution to design and operate its system so that in the event of an accident, it can physically rearrange its operations promptly and minimize the number of consumers who are shut off.

For this reason alone, it appears incumbent on pipeliners to take every reasonable measure necessary to provide connections wherever feasible in order that interruption in pipeline supply be minimized to the fullest extent possible.

Consideration of the possibilities of connections to provide the safeguards against outages should not be confined to the simple project of adjacent lines of two companies where pressure conditions and other operating factors are such as to make it readily possible for one to deliver gas to the other with only the opening of a valve. Situations prevail where only one of two adjacent lines can physically deliver gas to the other. The return of such gas may possibly be more practicable at another location where operations are compatible to effect either the return or the initial delivery of gas in the event of an emergency on the other line.

The use of such arrangements has proven feasible in many cases. One specific example involves a series of interconnections between two companies where emergency deliveries at the eastern end are returned in the southwestern producing areas, as circumstances dictate, to the advantage of both. Furthermore, deliveries and return of emergency gas need not be made directly by physical connection between the participating companies. Many emergencies, particularly during the war years, were successfully reduced by so-called displacement. That is, third and even fourth or fifth parties having mutual operations in an area can exchange gas by having the company with gas available take on a part or all of an obligation of the company in trouble with the latter cutting back on its normal obligation. To bring them about . . . is most difficult unless prior planning is made so that dispatchers and other operating personnel are prepared and necessary legal procedures, such as regulatory approvals and contracts, have been taken care of in advance.

Maintaining adequate supplies

Conservation of the Nation's natural gas resources is of paramount interest today. Situations may exist whereby the production in a given area is insufficient to maintain normal operations. On the other hand, the production available may also be in excess of pipeline requirement elsewhere. The solution here is obvious, the first company by exchange arrangement makes up its deficiency while the second is able to satisfy its producers and maintain rateable takes.

Conservation measures have substantially reduced the waste created by flaring of gas. There is still a substantial volume of gas being flared.

The figures for Texas during the month of September 1953 alone were in excess of 20 million Mcf. Certainly, with careful planning and the use of interconnections, including multi-company displacement, further substantial reductions in this wastefulness should be afforded. The feasibility of such programs has been enhanced manyfold in the past decade by virtue of the substantial growth of underground storage programs. . . .

About the only limitation on the ability to take excess flare gas is pipeline capacity, which could almost miraculously be found through careful planning of interconnections and displacements. That is not an idle dream; actual cases can be cited in which, through such interconnections and displacements, substantial volumes of gas were made available for storage and other uses at locations remote from the original source. Such gas sold to the storage company for its own use or stored for the account of other companies . . . is another reason why interconnections require proper planning.

'Spot purchase' gas is usually attractive to a pipeline company because of its lower cost. Unfortunately, spot gas may be available to the most convenient pipeline at times when it cannot be utilized. It is readily conceivable, however, that more of that gas could . . . find its way to market or storage.

We know that many long-term gas purchase contracts with producers contain provisions whereby payment must be made for specified volumes whether or not taken, the so-called 'minimum or take-or-pay-for-provisions.' True, there is usually a credit built up for gas not taken but paid for providing the gas is taken in a reasonable period of time. This situation, however, may create

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Old Days Recalled...from AMERICAN Gas Journal

ESTABLISHED 1859

90 YEARS AGO

March 1864

WOODEN GAS-PIPE. *Some gas companies, it is said, are using wooden gas-pipe, well coated with coal-tar. This is in consequence of the high price of iron pipe. We are inclined to think that the leakage accounts of these companies must be large.*

MARCH 1864

GAS FROM COTTON SEED. *In several of the Southern cities which have lately been captured by the United States forces, cotton seed is the only material for making gas. The pressed cake has long been used for gas-making with excellent results.*

MARCH 1864

GAS-LIGHT IN STEAMBOATS. *The steamboats on the North* [Hudson] *River, known as belonging to the People's Line, are all to be lighted with gas. Some of the boats have already had the gas introduced, and the success of the innovation has been so marked that the other boats are all to have gas-holders put on board, so that they will be in readiness for the ensuing season. The boats take their supply of gas at Albany, which serves them for the round trip.*

MARCH 1864

MEMPHIS, TENN. *The price of gas now charged at Memphis is $5 per thousand cubic feet, with 10 per cent discount on all bills paid within five days after the presentation of the bill. If not paid within ten days, the flow of gas is stopped.*

50 YEARS AGO

March 1904

The Cruse-Kemper Company has been awarded the contract for the construction of a storage holder, up to retaining 400,000 cubic feet, on the plant of the Fitchburg (Mass.) Gas and Electric Company. It is to be of the 2-lift order, and is to rest in a steel tank.

MARCH 1904

Mr. J. A. Mayers has secured a contract for the Gas Machinery Company, of Cleveland, O., under which the latter will construct, for the Queens Borough Gas and Electric Light Company, of Rockway, N. Y., a water gas set up to a production of 400,000 cubic feet per day.

MARCH 1904

Mr. W. H. Snow, Manager of the Holyoke (Mass.) municipal gas works vouches for the authenticity of this new style of consumer's complaint, which was mailed to him by a prominent resident of Holyoke—Oh! that "there were more of him!"

"Mr. W. H. Snow: Dear Sir: I am in receipt of my gas bill for the last quarter and I must say that I am very much disturbed over it. I don't understand how I could have used so little gas. I have had all I wanted for lighting, some for cooking, and we have had considerable illness, with nurses, etc. Of course, I have put in during this Quarter 3 Welsbach lights, and my house was never better lighted than it has been during the last 3 months. In these times, when the standing of a man is fixed by the quantity of gas that he consumes, you will readily appreciate that I feel grieved at the standing I must have in a quarter like this."

MARCH 1904

It looks that the rate which may be charged for gas for the ensuing year in San Francisco, Cal., will not be changed. It is low enough in any sense, the figure being $1 per 1,000 cubic feet.

MARCH 1904

Mr. Roth, representing one of the Baltimore districts in the lower branch of the Maryland Legislature, has introduced a bill directing that the gas rate in Baltimore shall not exceed 75 cents per 1,000 cubic feet. There is no chance that the measure will become a law.

25 YEARS AGO

March 1929

C. H. Dickey, President, Pacific Coast Gas Association, and F. S. Wade, Vice President, Southern Counties Gas Company, welcomed the Executive and Advisory Committees of the American Gas Association at Los Angeles. After opening remarks by Oscar H. Fogg, President, American Gas Association, E. L. Hall, Gen. Supt., Portland Gas & Coke Company, Oregon, said, "The attack that electricity makes upon gas is largely psychological. . . . But one must always remember that behind the electric range is the electric industry highly organized, efficiently managed and assisted by propaganda with which the gas industry has been unable to cope . . . the gas industry . . . cannot afford to allow the enemy to gain a foothold in any one section of the country."

MARCH 1929

At a recent meeting of the Board of Directors of The United Gas Improvement Company, Mr. John E. Zimmermann, prominent in Philadelphia engineering circles since 1899, was elected to the office of president.

MARCH 1929

At the Annual Meeting of the New England Gas Association in Boston, Mr. J. J. Quinn, President, Citizens Gas Light Company, Quincy, Mass., was elected President of the Association for the ensuing year.

American Gas Fundamentals

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- *Methods of estimating reserves
- *Chemicals from gas
- *Natural gas conservation
- *Underground storage of natural gas

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***Indicates chapters published since January 1, 1951; available without charge to new subscribers to American Gas Journal.**

How to Use the Material

American Gas Fundamentals *is a comprehensive compilation of basic gas facts to guide any gas utility employee toward a broader understanding of the industry as a whole.*

The series is designed to be removed from each current issue of AMERICAN GAS JOURNAL *and filed in a ring binder where it may be accumulated into a text book of permanent usefulness. Material should be filed under the major subject head appearing in the upper right hand box at the head of each chapter.*

Glossary of Gas Industry Terms: Pur to Spe

P—CONTINUED

PURGE To thoroughly clean a pipeline or piece of equipment so that all the material it contained is removed.

PURGE PIPE An extra draft stack on a coal-fueled water gas set through which gases escape when coal is charged into the generator.

PURIFICATION The process by which unwanted impurities are removed from a material.

PURIFIER Equipment used in the process of purification.

PURIFIER BOX A type of purifier in which hydrogen sulphide is removed from manufactured gas by passing the gas through a mixture of wood shavings and iron oxide.

PURIFIER BOX ROTATION The passing of gas through alternate purifier boxes in a group according to a set sequence.

PURIFYING MATERIAL The material used to remove impurities, such as the iron oxide and wood shavings used to remove hydrogen sulphide from manufactured gas.

PUSHER Mechanical ram which pushes coke out of a coke oven or coal gas retort.

PUSHER END The end of a coke oven or coal gas retort at which the pusher enters.

PYROMETER High-temperature measuring instrument.

Q

QUENCH Rapid cooling of heated material, with water, oil or air.

QUENCHING TOWER An elevated water tank under which cars of hot coke can pass and have water sprayed on them to cool the coke.

QUICKSILVER The metallic element mercury.

R

RACK PIPE To stand drill pipe on the drilling derrick floor or to stack pipe on a horizontal rack.

RADIANT A unit of a burner, generally made of ceramic material which, when heated by gas, glows from dull red-to-white and radiates heat.

RADIANT SECTION That portion of the liquid-carrying tubes in a boiler, tube-still, or heating furnace, which are exposed to the radiation from the flame and hence are primarily heated by radiation.

RADIATION Heat transmission through waves unaffected by the medium through which they pass.

RADIATION PYROMETER A temperature-measuring device for recording very high temperatures by focusing the radiation of the heated area through a telescope upon a thermocouple. The electric current generated in the thermocouple is read on a dial calibrated to read in degrees the temperature of the heated area.

RAM (See Pusher.)

RANDOM LENGTH Lengths of material, generally pipe in the gas industry, that differ from standard. If pipe is bought in random 20′ lengths, individual pieces may vary from 18′ to 22′.

RASCHIG RINGS Cylindrical rings with the length equal to the diameter and with as thin a wall as possible. Used as a packing in gas absorption towers.

RATED HORSEPOWER The developed horsepower of an engine when operated under conditions specified by the manufacturer.

RATE OF FLAME PROPAGATION The speed of flame-travel in an inflammable gaseous mixture of fuel and air. Usually expressed in centimeters per second or feet per second.

RATE OF FLOW The volume or units of a material passing a given point in a system per unit of time.

RATIO The relation between two quantities of the same kind, expressed as the fraction one quantity is of the other.

RAW MATERIALS The basic substances from which usable products are produced.

RAW NATURAL GAS Natural gas as it comes from the ground before it is processed or cleaned.

REACTION The chemical combination of two or more elements or compounds to form a new compound. Physically, the resultant effect of the application of force or energy upon an object or material.

REACTIVITY OF COKE A measure of the ease with which a particular coke will enter into the water or blue gas reaction.

REAGENT Any material which causes a chemical reaction when added to a second substance.

REAM To scrape or abrade a pipe, tube or round opening to the required size.

RECIPROCAL COMPRESSOR One in which compression is achieved by a piston moving back-and-forth in a cylinder.

RECIPROCATING ENGINE One which transmits power by means of a back-and-forth motion.

RECORDING GAUGE A gauge equipped to make a continuous chart record of the value of the variable being measured.

RECTIFICATION Conversion of an alternating electric current into a pulsating direct current.

RECUPERATOR, RECUPERATION A heat exchanger designed to heat incoming air stream to a coal gas plant with the stream of hot flue gases from the plant without mixing of the two streams.

RECYCLING The return of a portion of the material of a process to an earlier stage for reprocessing. In oil production practice, all or a part of the natural gas produced with the oil is returned to the production strata to maintain the reservoir pressure and increase the ultimate oil recovery.

REDUCER A pipe fitting that is larger at one end than the other—used to connect two different sizes of pipe.

REDUCING ATMOSPHERE A gaseous environment which tends to deoxidize materials with which it comes in contact. Used in certain metal heat treating operations to prevent oxidation of the metallic surfaces and to remove any oxides that are present.

REDUCING TAPER ELBOW A reducing elbow which uniformly decreases in diameter as it curves toward the small end; used to connect two different sizes of pipe.

REDUCING TEE A T-shaped pipe fitting having two different sized openings. The reduction may be either on the run or the branch of the tee.

REDUCING VALVE A lever or spring-loaded valve which maintains a constant lower pressure on the downstream side of the valve.

REEL OVEN A large insulated sheet metal cylinder containing a revolving cage upon which trays, containing material to be baked, are hung. Near the bottom a loading door is provided for loading and unloading the trays. Heated air or flue gas is passed through the oven.

REFERENCE GAUGE An accurately-calibrated gauge used solely for the verification of the accuracy of gauges in actual measurement use.

REFINE Separate and purify into component parts or distinct fractions.

REFINERY A crude oil purification and separation plant.

REFRACTORY CEMENT Cement that is resistant to high temperature and used for joining refractory bricks and for refractory linings of furnaces and ovens.

REFRACTORY MATERIAL Substances which will not decompose under very high temperatures; used for lining furnaces and ovens.

REFRIGERANT A vapor that can be condensed at atmospheric temperature under readily-obtainable pressure and will then evaporate at a suitable temperature and under a lower pressure.

REFRIGERATION CYCLE The full sequence of condensation and evaporation. The heat of evaporation is obtained from the material to be cooled.

REFRIGERATING CAPACITY The amount of heat removed by a refrigerating system during a specified period of time, expressed in Btu per hour.

REFRIGERATION TON 200 Btu per minute of heat removal.

REGENERATOR A unit of a coke oven plant containing two sections, each containing brick checker-work. Hot flue gases are passed alternately through the sections to heat the brick, after which the air to burn the producer gas is passed over the brick to preheat the air.

REGISTER, REGISTRATION The meter-dial positions of a gas meter index is the registration. The difference between two successive registrations indicates the volume of gas that has passed through the meter.

REGULATING VALVE (See Valve.)

REGULATOR (See Pressure regulator and Governor.)

RELATIVE GAS DENSITY Ratio of the weight of a given volume of a gas to the weight of an equal volume of hydrogen under the same physical conditions.

RELATIVE HUMIDITY The ratio of the volume of water vapor in the atmosphere to the volume the air would hold if completely saturated at that temperature. Usually expressed as a percentage.

RELIEF HOLDER (See Gas holder.)

RELIEF VALVE A valve designed to quickly reduce the pressure-differential across it when such differential exceeds the predetermined maximum. May be used for either pressure or vacuum relief.

REPRESSURING Increasing crude oil production by forcing gas produced with the oil, under pressure, back into the oil sands; also done with water. See also Recycling.

RESERVE STORAGE A supply of essential material accumulated from normal supplies for use when the normal supply is interrupted.

RESERVOIR A structural arrangement of rock strata which forms a trap for the accumulation of oil and gas.

RESERVOIR ENERGY The amount of energy available in a gas or oil reservoir for producing the gas or oil by natural flow.

RESERVOIR PRESSURE The pressure existing at the level of the oil pool when the well is shut-in and not flowing; the pressure at the well-head plus the pressure of the column of liquid standing in the well, when the well is shut-in.

RESIDUAL OIL, RESIDUUM OIL The remaining portion of crude petroleum oil after removal of the more valuable materials such as gasoline, fuel oils and lubricating oils.

RESIDUE The remaining portion of a material after a physical change in its form or content.

RETORT (See Coal gas retort.)

RETORT CARBON Hard, dense, graphitic carbon, formed on the walls of a coke oven or a coal gas retort.

RETURN AIR DUCTS Pipes or ducts to return air for reheating and recirculation in a warm air heating installation.

RETURN PIPING Piping to carry water or condensed steam from radiators to boilers, for reheating and recirculation in a hot water or steam heating system.

REVERBERATORY FURNACE An industrial processing furnace in which the roof is sloped downward to form a restricted section at the rear of the hearth.

REVERSE AIR BLAST A part of a carbureted water gas cycle in which air is blown down through the top of the generator fire to heat the top of the fuel bed to a higher temperature than could be obtained with the usual bottom blast.

REVERSE AIR BLAST PURGE The first part of a reverse air blast in which the residual gas in the generator is forced through the back-run pipe and wash box.

REVIVIFY The reactivation of spent oxide used in removing hydrogen sulphide from manufactured gas.

REVOLVING GRATE A mechanical grate revolving on a vertical axis within a steel housing and so constructed that clinkers are automatically broken up.

RICH GAS The relatively-high heating value gas that is made in the first part of the carbonizing period in a coke oven or coal gas retort. Also used to describe wet gas, which is natural gas containing condensable liquid hydrocarbons.

RIG General term for the complete machinery and equipment used in drilling gas or oil wells.

RIGID METER CONNECTION Same as a Meter bar.

RISER PIPE A straight vertical run of pipe.

RIVER CLAMP Long, heavy iron or concrete sleeves installed on a pipeline to prevent injury to pipe laid in a river bottom and to weight the pipe.

RIVER DOG A device used to hold a pipeline on a river-bottom.

ROCK Any consolidated, naturally formed, mass of mineral matter constituting a substantial part of the earth's crust.

ROCK GAS (See Natural gas.)

ROCK HOUND Slang expression for a geologist.

ROCK OIL An early term for crude petroleum.

ROTARY BIT The cutting tool attached to the lower end of the drill pipe of a rotary drilling rig. The bit does the actual drilling of the hole through the formation.

ROTARY COMPRESSOR A compressor having a rotating core, eccentrically-mounted in a casing, and having movable vanes which entrap and compress the gas between the core and casing as the core rotates. Casing has an inlet on one side of core and outlet on the opposite side.

ROTARY DISPLACEMENT METER A positive-pressure blower used as a meter in which gas pressure turns the blower and the quantity of gas passing through is proportional to the number of revolutions.

ROTARY DRILLING A method for drilling wells using a bit attached to a revolving drill pipe.

ROTARY ENGINE One in which a bank of cylinders revolve around a stationary crankshaft.

ROTARY SCRUBBER A piece of equipment for removing impurities from gas by passing the gas over rotating surfaces that are partially immersed in water.

ROTARY TABLE OVEN An oven consisting of horizontal, circular tables mounted on a vertical axis and contained in a suitable housing with a loading door past which the tables rotate for loading and unloading.

ROTARY VALVE A valve containing a rotating core within a casing and having two or more parts in the casing and one or more passages through the core; flow through several lines can be controlled with one valve.

ROUGHNECK A member of the crew on a drilling rig. The tool pusher is the foreman of the crew and operates the drilling equipment.

ROUND TRIP The removal of drilling bit and pipe from a well and replacing them, as required to change the bit or test the hole.

ROYALTY The amount paid to the owner of land- or mineral-rights for permission to produce the mineral content. In gas and oil operations, the royalty is usually based on a percentage of the total gas or oil production.

RPM Revolutions per minute.

RUN The production period in the water or blue gas cycle; a run of pipe is a series of connected piping, generally in a straight line.

RUST Common name for iron oxide, which is the product of a reaction between iron and oxygen.

S

SADDLE A fitted plate, held in place by clamps, straps or welding, over a hole in a gas main, and into which a branch line or customer-service connection is screwed.

SAFETY CUT-OFF PILOT OR VALVE An automatic valve controlling the flow of gas to an appliance burner and so arranged that the gas supply will be shut off if the pilot-flame goes out for any reason.

SAFETY VALVE (See Relief valve.)

SAGS Low points in a gas pipeline in which liquids can collect.

SATURATED AIR Air containing all the water vapor it can hold at its temperature and pressure.

SATURATED HYDROCARBON A chemical compound of carbon and hydrogen in which all the valence bonds of the carbon atoms, not taken up with other carbon atoms, are taken up with hydrogen atoms.

SATURATED STEAM Steam at a temperature and pressure such that any lowering of the temperature or increase in pressure will cause condensation.

SCALING The deposition of insoluble precipitates on the inner surfaces of equipment, such as pipes or boiler tubes. Also used to describe the process of removing such precipitates.

SCAVENGING STROKE The engine piston stroke that pushes the burned gases out of the cylinder.

SCRAPER (See Go-devil or Pig.)

SCRAPER TRAP A short section of pipe, branching from the beginning or end of a section of pipeline, used to insert or remove a scraper.

SCREEN To separate solid materials according to size by passing it through a series of suitably-sized meshes or screens.

SCREW JOINT A type of connection in which two externally-threaded rods or pipes are connected by screwing them into an internally threaded connecting piece such as a coupling, elbow, valve.

SCRUB To remove certain constituents of a gas by passing it through a scrubber in which the gas is intimately mixed with a suitable scrubbing liquid which absorbs or dissolves the constituent to be removed from the gas.

SCURFING Removal of carbon deposits from the inner walls of carbureters, coal gas retorts or coke ovens.

SEAL To make a joint gas- or water-tight; to lock a gas meter or the lock on the meter. Also, a device used in sealing a joint.

SEALED-IN BURNER A burner tightly mounted on or in a furnace so that no secondary air can enter around the burner.

SECOND LAW OF THERMODYNAMICS Heat cannot pass from a colder to a warmer body without the expenditure of energy.

SECONDARY AIR Additional air needed for combustion of a fuel and mixed with the fuel outside the burners.

SECONDARY PRODUCTION OR RECOVERY Oil and gas obtained by the injection of air, gas or water into a production formation thereby raising the formation pressure and causing a resumption of oil or gas flow from the producing well.

SEDIMENTARY Rock formed from original deposits of mud, sand or gravel from rivers, lakes and seas.

SEND-OUT The gas delivery of a plant or system during a specified period of time.

SENSIBLE HEAT Heat which can be added or removed from a substance with only changes in the temperature or pressure of the substance, but no change in its physical state (solid, liquid or gas).

SEPARATOR A piece of equipment for removing one phase from another in a two-phase system, such as removing oil from water, oil from gas, ash from flue gas or tramp iron from coal.

SERVICE The maintenance and repair of customers' gas appliances and facilities. (See also Gas service.)

SERVICE COCK A small plug valve located just ahead of a gas meter and used to shut off the gas flow to the meter and the customer's piping.

GLOSSARY

SERVICE CONNECTION The connecting piping between a gas main and the customer's meter.

SERVICE DRIP A liquid-collecting trap at the low point in a customer's gas service piping when the piping cannot be sloped back to the distribution main.

SERVICE SADDLE (See Saddle.)

SERVICE TEE A tee in a customer's service piping with one leg closed and used for access to the service pipe in case of plugging with solids.

SET The equipment used in making manufactured gas (blue or water gas, carbureted water gas, oil gas), when considered as an overall unit. Also means to install.

SETTING The enclosing and supporting structure of a piece of equipment such as a boiler or coal gas retort.

SHAPE FACTOR Fraction of radiant heat from one surface which falls upon another surface.

SHAVINGS SCRUBBER A large vessel filled with trays of wood shavings through which manufactured gas is passed to remove tars, which are absorbed by the shavings.

SHUTDOWN Complete cessation of operation of a process or operation.

SHUT-OFF COCK A small plug valve placed in a customers' gas service piping and used to shut off the flow of gas.

SIDE BOOM A boom extending from the side of a tractor.

SIDE OUTLET An extra outlet at right angles to the plane of the usual openings in a tee pipe fitting.

SIDE WALL CLINKER Fused ash formed on the inside surfaces of a boiler or gas generator.

SIDE WALL FLUE A flue located in a coke oven wall to carry the coal carbonizing gases.

SILICA BLOCKS, SHAPES AND TILE Formed silica (silicon dioxide) used as lining material in coke ovens and coal gas retorts.

SILICA CEMENT Mortar made with relatively pure silica and used to join silica blocks.

SILICA GEL A silicon compound, a desiccant which readily absorbs substantial quantities of moisture and is used to reduce the relative humidity of air in specific locations.

SILICON CARBIDE (See Carborundum.)

SIMULTANEOUS GAS-OIL BURNER A burner firing gas and oil at the same time.

SINGLE-STAGE COMPRESSOR Compressor in which the complete compression takes place in one cylinder.

SKIP A meter that is not read at the regularly-scheduled time and must be read later.

SKUNK OIL Odorant added to natural gas to aid in detection of leakage.

SLEEVE BEARING A hollow cylinder of low-friction metal in a suitable housing and fitted closely around a rotating shaft. Used to support the shaft but permit it to turn freely.

SLICE Break up fuel-bed clinkers with a long steel bar called a slice bar.

SLIDE VALVE (See Valve.)

SLIPPAGE The extent to which a meter registers less than the correct volume passing through the meter.

SMALL-PORT BURNER A manifold with many small holes through which a gas-air mixture is fed to burn outside the holes.

SODA ASH (Sodium carbonate, Na_2CO_3) A chemical compound used as a water softener in boiler feed water treatment.

SOFT FLAME A gas flame with a relatively small amount of primary air.

SOLDER An alloy of two or more metals used to join other metals together by surface adhesion.

SOLID SLEEVE A short piece of pipe, with an inside diameter large enough to fit snugly around another pipe.

SOOT Black substance, mostly finely-divided carbon, which results from incomplete combustion.

SOUR NATURAL GAS Natural gas containing such amounts of sulphur compounds as to make it unusable without purifying.

SPACE HEATER An individually-fired appliance used to heat a room or part of a room.

SPECIAL ALLOY PIPE Pipe made to withstand unusually severe conditions.

SPECIALS (See Line fittings.)

SPECIFIC GRAVITY The ratio of the weight of a unit volume of a substance to the weight of the same volume of a reference substance, both at specified physical conditions.

SPECIFIC HEAT The heat required to raise a unit mass of a substance through a degree of temperature difference.

SPECIFIC VOLUME The volume of a unit weight of a substance under specific conditions of temperature and pressure.

The Glossary of Gas Industry Terms, of which this the seventh installment, is being compiled by Robert M. Poe.

YOUR LAST CHANCE

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DELTA Power Tools

2 BIG CONTESTS

Sponsored by

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To Stimulate Thinking About

A PLANNED METER RETIREMENT PROGRAM

DEADLINE FOR ENTRIES APRIL 30, 1954

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FIRST AWARD IN ESSAY CONTEST

This complete set of DELTA Industrial Type power tools. Consists of: (1) a 10" Tilting Arbor Unisaw, (2) a 6" Jointer on Steel Stand, (3) a 14" Drill Press, (4) a 14" Band Saw, (5) a 7" Bench Type Tool Grinder, (6) a 12" Wood Turning Lathe and, (7) a 24" Variable Speed Scroll Saw. Each tool complete with motor, switch and valuable accessories.

A TOTAL VALUE OF $1,750.64

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SECOND AWARD IN ESSAY CONTEST

A complete shop of DELTA Homecraft power tools. Consists of: (1) an 8" Tilting Arbor Saw, (2) a 4" Jointer on Steel Stand, (3) an 11" Drill Press, (4) a 10" Band Saw, (5) a 16" Scroll Saw, (6) an 11" Wood Turning Lathe and, (7) a 6" Bench Grinder. Each tool complete with motor, switch and valuable accessories.

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SECOND AWARD IN JINGLE CONTEST

A DELTA Homecraft Saw and Jointer

combination complete with motor, switch and many accessories.

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An 11" DELTA Homecraft Drill Press,

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IT'S EASY TO ENTER
IT'S EASY TO WIN!

For details, contest rules, and helpful tips on how to win these valuable prizes see next page.

...e's All You Need Do To Enter The

2 BIG Rockwell CONTESTS

JINGLE CONTEST

COMPLETE THE LAST LINE OF THIS JINGLE

Programmed meter replacement, if it's not neglected
Will keep you and your customers fully protected.
Repairing worn meters can frequently be
A false and expensive economy.
Planned scrapping of "antiques," smart meter men say

This contest is easy—anyone in the gas business can enter and win. Just study the tips on meter repair practices listed on this page. Then write a clever, informative last line for the jingle. As an example, the last line could read:

"Will solve accuracy problems, the logical way."

ESSAY CONTEST

Write a paper not exceeding 2,000 words in length on the subject:

"The Economics of a Planned Meter Retirement Program"

Here is a topic gas company executives, accountants, engineers, distribution and repair shop men can all write about. Contestants can cite actual instances (with supporting figures) to document their entries or give their own arguments with regard to meter repair and retirement practices. Logic and clear thinking will count equally as well as past meter repair experience.

Contestants will, at the discretion of the Editor, be offered a $25.00 cash release fee for the use of their papers in the Rockwell publication—the Flow Line.

TIPS ABOUT GAS METERS AND METER REPAIR PRACTICES

Ancient meters, like old automobiles, were not designed to be repaired forever.

Many meters 40 years old or older are still in service. They may have been repaired several times—sometimes completely rebuilt.

The cost in parts and labor for rebuilding a worn out meter can frequently exceed the cost of a new meter.

Because of mechanical deficiencies a repaired "ancient" will not stay accurate for as long a period as a new meter.

The cost of replacing an old meter that becomes a "D.R." in service can approximate that of a new one.

Meter repair shops that maintain accurate cost records can prove the economy of scrapping meters that have outlived their usefulness.

CONTEST RULES AND REGULATIONS

Only those employed by gas utilities or those associated with gas utilities as consultants (such as engineering, tax, accounting, or operating consultants) are eligible to participate.

Contestants must live in either the United States or Canada.

All entries must be accompanied by coupon clipped from any contest announcement. Only one coupon is required to identify a contestant who submits a number of entries at the same time. Entries must be personally written by the contestant whose name appears on coupon.

Write on one side of paper only. DO NOT put name and address on any entry.

An executed coupon will serve as contestant's identification.

Contests close April 30, 1954. Entries must be postmarked on or before that date.

All entries will be impartially judged by a panel of informed gas utility authorities. Names will be announced later.

Judging will be completed as soon as possible after closing date and winners' names will be published in the trade press.

The decision by the judges will be final. All entries become the property of the sponsor and none will be returned.

In the case of ties duplicate prizes will be awarded.

ROCKWELL

USE THIS COUPON

Fill in coupon with name and address. Clip, pin or staple to entry sheet or sheets. Upon receipt a code number will be assigned to each contestant and this number alone will appear when subject matter is being considered by the board of judges. *No entries accepted without a coupon.*

ROCKWELL MANUFACTURING COMPANY 5

Pittsburgh 8, Pa.

Attached find entry or entries for

ESSAY CONTEST ☐ **JINGLE CONTEST** ☐

Check in boxes provided. Where entries are submitted in both contests, check both boxes.

YOUR NAME_____ TITLE_____

COMPANY NAME_____

STREET_____

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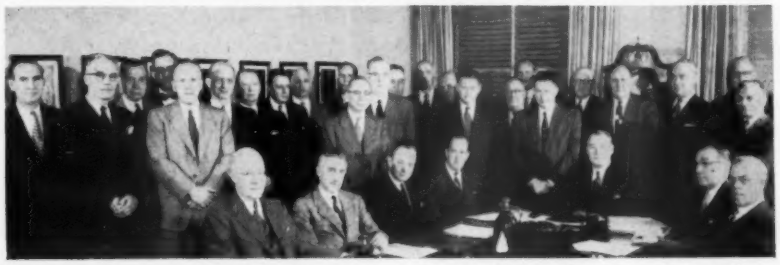
News of the Gas Industry

THE BOARD OF DIRECTORS OF AMERICAN GAS ASSOCIATION



Seated, left to right: Everett J. Boothby, president, Washington Gas Light Co.; Dudley B. W. Brown, president, Milwaukee Gas Light Co.; James F. Donnelly, vice president, Servel Inc.; W. T. Stevenson, president, Texas Gas Transmission Corp.; E. H. Eacker, president, AGA, and president, Boston Consolidated Gas Co.; H. Carl Wolf, managing director, AGA; and L. B. Bonnett, vice president, Consolidated Edison Company of New York, Inc.

Standing, left to right: A. T. Gardner, vice president and secretary, Delaware Power & Light Co.; Walter Kurdelski, residential sales manager, Michigan Consolidated Gas Co.; D. E. Karn, president, Consumers Power Co.; Curtis Morris, Washington representative, AGA; J. Theodore Wolfe, executive vice president, Consolidated Gas Electric Light & Power Co. of Baltimore; Howard B. Noyes, vice president, Washington Gas Light Co.; James F. Daly, assistant treasurer, AGA, Long Island Lighting Co.; L. B. Richards, vice president, Harrisburg Gas Div., The United Gas Improvement Co.; Frank C. Smith, president, Houston Natural Gas Corp.; John E. Heyke, Jr., president, The Brooklyn Union Gas Co.; N. Henry Gellert, president, Seattle Gas Co.; H. C. Cummins, first vice president, Northern States Power Co.; Charles C. Eeles, district industrial sales manager, The Ohio Fuel Gas Co.; F. T. Parks, vice president, Public Service Co. of Colorado; Frederic O. Hess, president, Selas Corporation of America; J. K. Horton, president, Pacific Public Service Co.; Kurwin R. Boyes, secretary, AGA; Lyle C. Harvey, president, Affiliated Gas Equipment Inc.; A. W. Lundstrum, president, The Ohio Fuel Gas Co.; H. Leigh Whitelaw, managing director, GAMA; Wister H. Ligon, president, Nashville Gas Co.; Charles G. Young, president, Springfield Gas Light Co.; E. R. Acker, president, Central Hudson Gas & Electric Corp.; and Frederick J. Pfluke, superintendent of gas operations, Rochester Gas and Electric Corp.

Radio Systems Expand in Industry

One of the most spectacular developments in recent years in the natural gas pipeline industry has been the tremendous growth of microwave systems. This was said by Joseph E. Keller, special representative of the central committee on radio facilities, American Petroleum Institute, at the Gas Supply, Transmission and Storage Conference sponsored by American Gas Association, in New Orleans.

Tracing the history of communications developments in the pipeline industry, Mr. Keller pointed out that although the industry itself is more than 80 years old, suitable microwave facilities have been available to oil and gas pipeline companies only since 1948. Yet today microwave systems are operated by 22 different companies whose systems total 14,548 system miles and represent an investment of over $17 million.

These 22 companies represent a plant investment of $3 billion. Included in the group are 10 of the 20 pipelines considered by AGA to be major interstate gas transmission lines. The microwave facilities serve as rapid communications systems for some 80,000 miles of pipelines carrying crude oil, products and natural gas valued at $4 billion a year.

The 22 companies represent only a little more than one-third of the existing pipelines. Mr. Keller predicted that many of the other companies will experience a continuing demand that they utilize their facilities even more effectively than they do today.

This will mean that communications needs will be greater and more stringent, he said, and will result in the installation of microwave facilities by many of these companies, thereby contributing to national defense and to every segment of the national economy which these installations make possible, unless this growth is hampered.

Transcon Files More NY Deliveries

Transcontinental Gas Pipe Line Corp. has filed an application with Federal Power Commission for a certificate of convenience and necessity which would permit the company to serve an additional 61,500 Mcf of natural gas per day to the New York joint facilities to be distributed as follows: Consolidated Edison Company of New York, 30 MMcf; The Brooklyn Union Gas Co., 25 MMcf; Long Island Lighting Co., 5 MMcf; Brooklyn Borough Gas Co., 1 MMcf, and Kings County Lighting Co., 500 Mcf.

Included in the application is a request for authority to serve 30 MMcf per day to the Public Service Electric and Gas Co. of New Jersey.

The application is in competition with one filed by Tennessee Gas Transmission Co. in December 1953, except that service to Brooklyn Borough Gas Co. and Kings County Lighting Co. is not included in the Tennessee application.

Transcontinental stated in this application that it will shortly file an application for a certificate for expanded service to its customers in Philadelphia and South Jersey, Delaware, North and South Carolina and other southern states along its line.

The company also announced that it has filed an application for a certificate of convenience and necessity to build facilities which will add an additional 20 MMcf of line capacity on or about November 1, 1954 to be used for transportation of 10 MMcf of gas per day for Sun Oil Co. to its Marcus Hook refinery in Pennsylvania from Sun's Gulf Coast gas supply. The remainder of this 20 MMcf additional capacity will reinforce the company's ability to maintain the capacity required to serve its present customers.

Mary E. Kelleher

The staff of AMERICAN GAS JOURNAL suffered a sad loss on February 24, when Mary E. Kelleher, our much-loved friend and co-worker passed away suddenly, after a short illness, at the age of 46 years.

Molly Kelleher was secretary and assistant treasurer of the corporation and circulation manager of our publication. Of her, it could be truly said that she was a bright tower of strength whose pleasant personality contributed much to her associates. That pleasant personality is missed here now, and in October her many gas industry friends will miss her at the American Gas Association's convention.

It was 30 years ago that Molly came to the old offices of the JOURNAL to start work for the late Stanton G. Krake, a former editor. From that first day, at the age of 16, she devoted herself to the JOURNAL.

Elliott Taylor, who passed away two scant months earlier, often expressed his intense admiration for Molly's cheerful spirit, her determined and capable application to our mutual efforts.

Meter Reader Errorless 23 Years

A report released in February by the commercial department of The Brooklyn Union Gas Co. shows that in 1953 22 meter readers completed from one to 23 years of errorless reading.

In the forefront of the errorless meter readers is William P. Bartik, who not only has maintained an errorless record for the greatest number of years but who also has the highest total of perfect readings. He has been error-free for 23 years. During that time he read 450,415 meters.

In addition to Mr. Bartik, two other men have stayed on the path of accuracy for a good number of years. Joseph DeLeva has read without error for 17 years and James A. Greenrose has achieved 10 accurate years.

Besides Mr. Bartik, men who attained high totals in perfect readings are Howard A. Metzger with 263,169; Mr. DeLeva with 156,310, and Robert H. Owens with 108,922.

Patent Validity and Infringement Laws Altered in Recent Cases

(Continued from page 20)

This court explained that no contract is valid unless both contracting parties have supplied valid "consideration", and valid "consideration" is any act or promise on the part of a contracting party. In this case there was no valid consideration on the part of the company because it had performed no act or made no promise to the employee at the time the contract was signed.

Patent information

It is well worth knowing that a patent expires in 17 years, and under no circumstances may it be renewed. However, if a user contracts to pay royalties for a period beyond the time when the patent expires he must continue to pay royalties after expiration of the patent. This is true although the invention may be used, manufactured, and sold generally by the public without interference by the patentee.

On the other hand, a license contract may be invalid and illegal for many reasons. In one recent case (226 U. S. 20) the Supreme Court held that a license agreement is void when in its terms a patentee tries to eliminate competition.

In another case (258 U. S. 451), the court held a license contract void because it contained a stipulation by which the user of patented equipment agreed not to use devices made and sold by competitive manufacturers.

The courts have established new law to the effect that any company or person purchasing a patented device may use it as he sees fit. In other words, the seller of a patented device cannot under modern law restrict the uses to which the purchaser of the article may put it. Therefore, a notification upon a patented device, which is intended to limit or restrict the uses of the patented article, is illegal.

The courts hold that when a patented machine or device wears out, the user must discard it and buy a new one. He cannot make it over by supplying new parts and repairs.

A United States Court, in Harrison v. St. Louis, 77 E. 740, explained, on this subject:

"The rule is established that a person . . . has the right to repair a part of the machine or device provided that the part so replaced is not separately covered by a patent. . . . The fact that the device is patented does not lessen the owner's right to put it in order when it gets out of repair, unless considered as a whole, it is worn out and useless. When a patented machine is accidentally destroyed, or when it is practically worn out, the owner thereof, under the guise of repairing it, cannot make a new machine. In such cases, he must cast it aside and buy a new one from the patentee."

Rights of inventor

Modern courts consistently hold that the owner of a patent may, if he desires, refuse to manufacture, sell or license his invention. Moreover, all those who make, sell or use a patented invention, without authority of the patentee, are liable as infringers.

Also, it is important to know that the owner of a valid patent is privileged to sue for infringement, the manufacturer, seller, or user of the invention, or all of them. Thus the owner of the patent is enabled to forestall extensive infringement with little difficulty.

Many inventors have formed the habit of imprinting on their manufactured product the terms "Patent Applied For", or "Patent Pending". However, these markings mean nothing more than that the inventor has applied for a patent. He cannot sue and recover damages for infringement. In fact, unless an inventor receives a valid patent he has no more legal rights to stop infringement than a person who neither invented the device nor filed an application.

On the other hand, when an inventor files his application for a patent he may justly imprint upon his product, "Patent Applied For" or "Patent Pending". In this manner he warns the public that he is endeavoring to obtain a patent. Many inventors continue to imprint these notifications on their products for many years after they have been notified by the Patent Office that a patent will not be granted. Thus, persons are misled into believing that the inventor has protection against others infringing his right when, in fact, he has none.

Infringement liability

It is important to avoid infringement of patents because various courts have held that an infringer is liable to a patentee in an amount equal to all profits earned, plus any and all damages which may have been sustained by the patentee. If the infringement is intentional and wilfull the damages allowable may be three times the actual damages.

Recently, a court laid down this law: A company may be liable for infringement of a patent under either of the following conditions: (1) if it uses it; (2) if it makes it for its own use; (3) if it purchases a part and combines it with other parts, which comprises an infringing device; (4) if it conspires purposely or unintentionally with another to avoid infringement and contributes in any manner to an infringement; (5) if it purchases and resells an infringing device, although the purchase is made believing the one from whom the purchase was made had a license from the patentee to sell or use the device; (6) or, if it repairs a worn out part.

Bond Market at New Three-Year High

(Continued from page 18)

course, and not reduce them. With business activity showing only a mild and gradual decline, these opponents point out, and the demand for borrowed funds still quite large, an ample supply of credit at existing interest rates would be preferable to an oversupply at falling rates.

They further aver that a forced reduction in interest rates at this time would bring about unnecessarily wide fluctuation in the money and capital markets, which would represent just as much a step toward unduly easy money as the measures adopted last spring by the Treasury and Reserve authorities which brought about too tight a money condition and a consequent sharp increase in interest rates.

Reduction recently made in the rediscount rate suggests that the run-off in business may be a bit deeper than the credit authorities would like to see. Industrial activity currently is running about 125% of the 1947-1949 index, compared with 134% at this time a year ago, and unemployment is believed to approximate 3,000,000 persons.

As a consequence, the Treasury Department might be expected to think twice before offering any large volume of long term bonds in coming weeks, lest it disturb the present declining trend of interest rates. If a long term issue is marketed it probably will be considerably smaller in amount than originally planned.

In their recent market action public utility common stocks have not duplicated the erratic course of industrial and railroad equities but have pursued the even tenor of their ways. Three of the five groups comprising the AMERICAN GAS JOURNAL index have shown no change whatever during the past month, an experience unheard of heretofore. Yields in many cases are low, being well below five %. Preferred shares have been strong, rising to new high marks for the past several years, with sharp paring of yield return.

The satisfactory market action of all three types of securities—bonds, preferred and common stocks—suggests a continuing favorable basis for the gas companies to effect the financing necessary over early future months to pay for heavy property additions and improvements still to be made.

MUFFLE OVEN PERFORMANCE

	Experimental Muffle Oven		Typical Fresh Air Ovens
	Experimental Burner	*Contemporary Burner*	
Burner input rate, Btu per hour	21,000	21,000	14,000-25,000; Avg.—21,000
CO_2—per cent at nominal rate	6	8.6	2.5-4.6; Avg.—3.8
Flue loss to kitchen, Btu per hour	3,990	3,255	4,700
Average surface temperature, F above room:			
Sides	43	No test	56
Back	38	No test	72
Top	39	No test	69
Door	52	No test	85
Pilot rate, Btu per hour	100	100	700-1,000
Preheating to 400F, minutes (within 10 minutes)	5.5	6.5	5.2-9.25; Avg.—6.9
Heat distribution:			
Cakes	Excellent	Excellent	Excellent
Pumpkin Pies	Excellent	No test	No test
Biscuits	Excellent	No test	No test
By-pass rate, Btu per hour	1,000	1,730	4,000 to 6,000
Minimum holding temperature, F above room			
Burner & Pilot	110	170	170 on CP
Pilot only	18	18	No test
Effect of delayed ignition, natural and manufactured gases	No damage	No damage	Serious damage
Flexibility on peak load gases	OK	OK	OK
Over-all burner volume, cubic inches	4	10.8	Avg.—8

BROILER PERFORMANCE

	Experimental Broiler	Typical Broilers
Heat distrib. toast	Excellent	OK
Time, minutes	3.5	Within 10
Area covered, sq. in.	174	128
Preheat time to 600F, mins.	10	Avg., 12.67
Flue loss to kitchen during preheat, Btu per hour	4,340	6,536
CO_2—nominal input, %	5.6	3.5
Burner input, Btu per hour	14,000	13,500-25,000; Avg.—17,200
Average surface temp., F above room:		
Sides	61	64
Door frame	79	80
Rear	56	88
Panel (door)	57	58
Handle	14	24
Over-all burner vol., cu. in.	1/3	8
Turndown or pilot input rate, Btu per hour	160	Aerated, 800-1,000; Non-Aerated, 100-500
Flexibility on peak load gases	OK	OK

Newly Developed Principles of Domestic Range Equipment

(Continued from page 17)

to duplicate the speed with a well-designed burner rated at 6,600 Btu per hour and reduce the heat loss to the kitchen from 1,130 Btu to 540 Btu (or by approximately 50%) for the same operation. Since an efficiency of 58% may be obtained, the Btu input to the pan increases slightly—3,800 Btu versus the 3,600 Btu obtained with a higher rate and greater grate height.

The problem appears to be a question of which factor is of greater importance—speed of heating or reduction of heat loss to the kitchen? As these burners now stand, they are speedier and their heat loss to the kitchen is much less than most present-day burners of contemporary design. The postulation was opposed because of the fact that under the conditions of the efficiency test, most top burners become more efficient as the input rate is reduced, and reach a maximum efficiency between 5,000 and 7,000 Btu per hour input on natural gas.

Natural Gas Transmission Via Interconnected Pipelines

(Continued from page 21)

a serious obstacle in further negotiations for gas supplies and, on occasion, has worked to the disadvantage of companies with programs for expansion because further expansion requires more gas reserves and there is an economic limit beyond which a company cannot commit itself as to the payment for gas which may not be taken.

Interconnections in capacity operation

It is axiomatic that the higher the rate of capacity utilized, the lower the unit cost. High capacity operation has been achieved with success by disposition of gas on an interruptible basis. The weakness of this treatment has always been the fact that increased firm demand requires increased firm capacity with a corresponding increase in volumes available for sale on a non-firm basis. Higher costs of construction and of purchased gas are creating a further problem where, because of these price factors, the increase in capacity is not economically justified and non-firm gas cannot readily be sold at a satisfactory profit. The solution to this problem would be interconnection between pipelines coupled with greater utilization of underground storage.

Arrangements of this type have already been effected and several others are in various stages of process. A pipeline having its own storage reservoir can meet continued growth of firm market by injection of off-peak gas into storage for peak requirements. Incremental pipeline capacity construction may thus be materially reduced and revenues obtained for the gas theretofore dumped should be more compensatory.

This condition is not, however, as simple

as it sounds. In the first place, all pipelines do not have their own storage facilities where needed. Secondly, gas is required to develop a storage program. To meet the first problem, cooperative arrangements between pipeline companies and storage owners have resulted by one means or another, in making available storage space to those otherwise not so blessed. To fill these pools with gas quickly, then becomes the main problem. The storage owner and the participating pipeline company are not always able to meet the storage gas requirements from existing sources. The problem then is: shall they increase main line capacity for this purpose or is there another and better method available.

Other pipelines having surplus off-peak capacity by direct sales through interconnections and displacements may be prime source for the necessary gas. Another procedure is the relatively new practice whereby pipelines maintain high load factors on their sales by having excess firm gas stored for the account of customers subject to redelivery as needed. The delivery and redelivery is executed primarily through displacement minimizing to a considerable extent construction of additional transmission pipeline facilities for storage operation.

Designed interconnections

It does not make sense for two or more pipelines starting from the same area, or in part traversing the same area, or serving the same area each to go to the expense of duplicating facilities. No individual company would duplicate its own facilities unnecessarily and there appears to be no sound reason for neighbors not to avoid duplications in facilities among themselves. Thought should be given to the probability of providing further economy in pipeline construction by means of staggered installations; that is, one system installs capacity one year and the other the next so that during the two or three year period when loads are being developed, particularly in new areas, higher utilization and less expenditure on the combined operations may be possible.

There are any number of possibilities which can be achieved by sound engineering design.

Vital to defense

Surely, preplanning for the maintenance of adequate service to installations vital to our national security needs no justification. All of the previous economic advantages discussed herein should be considered when planning for national defense. Conversely, when consideration is given to interconnections for economic purposes, the national defense possibilities should not be overlooked.

Pulsation on Gas Measurement Outlined for Study

(Continued from page 15)

seems to exist for determining just how much capacity or how much resistance should be introduced to suppress pulsation to the extent that it is no longer harmful.

While it is generally known that a critical pressure drop between the pulsating source and the meter will eliminate pulsation, that is indeed an expensive way of eliminating the trouble and no doubt something less than a critical drop will suffice. Perhaps a research project might well be devoted to determine just how much of a pressure drop is actually necessary for such considerations as various capacities, frequencies and wave forms.

Research should be carried out to check the validity of some of the theory which has been propounded from time-to-time. For instance, use has been suggested of the Strouhal number, which relates orifice diameter, pulsation frequency, and flow velocity, to determine if and when a meter is subjected to excessive pulsation. It may be that the data obtained by a pulsameter and calculated from the flow system can be substituted into the Strouhal number to determine if serious pulsation exists.

Further time probably could be well spent in additional study of the application of the Hodgson number to the design of volumes for absorbing pulsation. This number relates specific volume of the fluid, its pressure, the pressure drop between the pulsation source and the meter, pulsation frequency, the flow rate, and the volume in the system between the pulsation producer and the meter.

Some or perhaps all of the pulsation-eliminating devices have merit, but who is to say whether or not the ideas have any worth. The proof would come by test of these devices after they had been built. It seems unfortunate indeed that no designated places exist where ideas can be submitted for trial. If use could be made of institutions which have facilities for constructing and testing any and all devices which may be suggested, some effective device for eliminating pulsation may be produced for a very nominal expenditure of research funds. Incidentally, if knowledge exists of any device that has some merit as a pulsation damper, it is urged that this knowledge be made known, particularly, if the device has had some preliminary trial.

While so much effort and money have been spent to insure a thorough job of measuring, when steady flow exists, it is unfortunate indeed that so little pulsation can render inaccurate an otherwise-accurate instrument. Certainly pulsation warrants most exhaustive research and most careful attention.

Adapted from a presentation at the American Gas Association Gas Supply, Transmission and Storage Conference, March 1954

FEDERAL POWER COMMISSION

TGT Rate Settlement Approved—Increase to be About $4,767,800

The Commission has approved a proposed settlement under which Tennessee Gas Transmission Co. will increase its wholesale natural gas rates by about $4,767,800 per year instead of by $6,510,100 annually as the company had originally proposed. The system-wide rate increase, effective as of March 1, 1954, was agreed to by all parties to the proceeding.

Tennessee filed its proposed increase last August, and it was suspended on September 24. Hearings commenced February 8, and after a series of conferences final agreement was reached.

The settlement is conditioned to require that if the actual Federal income tax payable by Tennessee for 1954 is fixed at less than the rate of 52%, Tennessee must file revised rate schedules reflecting this decrease and must make appropriate refunds to its customers.

The settlement also requires that if United Gas Pipe Line Co. is required to make any reduction in rates for gas which it sells to Tennessee, as a result of a pending rate suspension proceeding, Tennessee must file changes in its rate schedules to reduce its rates so as to pass the reduction on to its resale customers, and must refund to its customers any amounts received by it in connection with the proceedings.

Atlantic Seaboard-Virginia Gas Transmission Settlement Approved

The Commission has approved a settlement of rate proceedings involving Atlantic Seaboard Corp. and Virginia Gas Transmission Co. providing for an estimated reduction of about $2,856,000 per year in wholesale natural gas rate increases proposed jointly by the companies.

Subsequent to the filings, a merger was effected between the two companies—both subsidiaries of The Columbia Gas System, Inc.—with Seaboard as the surviving company.

The proceedings involved one proposed increase for about $3,037,000 per year, which went into effect under bond, and subject to refund, on March 7, 1952. The other proposed increase amounted to approximately $4,318,000 over and above the $3,037,000 increase. These increased rates went into effect under bond on February 15, 1953.

The agreed-upon rates will result in refunds to the companies' customers in West Virginia, Virginia, Maryland and the District of Columbia.

Atlantic Seaboard Corp. and Virginia Gas Transmission Co. have filed with the Commission higher rates, to supersede those in effect under bond and which would supersede those agreed to in this settlement.

Affirm Decision Rejecting East Tennessee Natural Rate Increase

The Commission has affirmed a decision by one of its examiners rejecting a proposed $426,417 annual wholesale natural

gas rate increase by East Tennessee Natural Gas Co. and directing the company instead to file a new rate schedule providing for an increase of only $132,939 per year.

East Tennessee will be required to refund to its wholesale customers the difference between the rates allowed and those which it has been collecting under bond since last May 2.

The only controversy in the rate proceeding involved the method of allocating East Tennessee's cost of service between sales for resale and direct sales. The examiner, in his January 14 decision, allocated the total system-wide cost of service between sales for resale and direct sales. East Tennessee, however, in exceptions to the examiner's decision, contended that its sales to the Atomic Energy Commission plant at Oak Ridge, Tenn., should be treated separate and apart from the total system.

The Commission said that since East Tennessee's system is integrated and unified, and operated as such, the examiner correctly concluded that the proper method of allocating costs in this instance is on a system-wide basis. In this way, FPC declared, all customers receiving benefits from the unified system operations also will share in the costs on a system-wide basis.

The action will affect East Tennessee's 17 wholesale customers, which supply markets in Tennessee.

Suspend Kentucky W Virginia Gas Co Proposed Gas Rate Increase

The Commission has suspended a proposed wholesale natural gas rate increase by Kentucky West Virginia Gas Co., Pittsburgh, Pa., amounting to $1,025,455, or 21.4%, annually based on sales for the year ended September 30, 1953. A hearing date will be set.

The increase, which the company proposed to make effective March 1, would affect Kentucky West Virginia's affiliate, Equitable Gas Co., Pittsburgh, and Louisville Gas and Electric Co., serving Louisville, Ky. The Commission said that the proposed increase has not been shown to be justified and may be unjust, unreasonable, unduly discriminatory or preferential or otherwise unlawful.

TGT Asks Facilities to Receive Gas from Louisiana Subsidiaries

Texas Gas Transmission Corp. has applied for authority to construct new pipeline facilities in Louisiana to enable it to receive additional natural gas from two wholly-owned subsidiaries.

The proposed facilities, estimated to cost $1,596,140, include an additional 2,000 hp compressor unit, 24 miles of 16-inch pipe, and a gas purchase meter station. The compressor unit would be installed at an existing station near Bastrop, La., and the new line and meter station would be located, respectively, in Acadia Parish and in Jefferson Davis Parish, La.

The facilities would enable Texas Gas to receive an additional 58,800 Mcf per day from the two subsidiaries—Louisiana Natural Gas Corp. and Texas Northern Gas Corp. The additional gas would increase the daily deliveries to Texas Gas from the two subsidiaries up to 201,700 Mcf per day.

Transcon Seeks Facilities Okay to Transport Gas for Sun Oil Co

Transcontinental Gas Pipe Line Corp. has applied to FPC for authority to construct pipeline facilities which will enable it to transport a maximum of 10 MMcf of natural gas per day on a firm basis for the Sun Oil Co. for use in its refinery at Marcus Hook, Pa.

Proposing to build a total of about 57 miles of pipeline which would parallel sections of its existing system in Louisiana, Mississippi and Alabama, Transcontinental estimated cost of the proposed new facilities at $6,533,000.

Transcontinental is seeking authorization to transport the gas from Starr County, Tex., or some other point agreed upon by the two companies, to its Marcus Hook meter and regulator station in Delaware County, Pa., for a period of 20 years beginning next November 1.

The application says that the proposed facilities will not only enable Transcontinental to transport the 10 MMcf of gas per day for Sun, but will also increase the company's sustained delivery capacity for the sale of gas to its utility customers by 10 MMcf daily.

Authorize East Tenn Natural Gas to Supply Gas to Paper Plant

The Commission has authorized East Tennessee Natural Gas Co. to sell a maximum of 9 MMcf of natural gas per day on an interruptible basis to Bowaters Southern Paper Corp. for use in Bowaters' plant now being constructed in the vicinity of Calhoun, Tenn.

The Commission said that the proposed sale to Bowaters will not adversely affect East Tennessee's ability to serve its wholesale customers. East Tennessee will construct the necessary metering and regulating equipment to make the sale to Bowaters.

NEW EQUIPMENT

Explosion-proof lamp

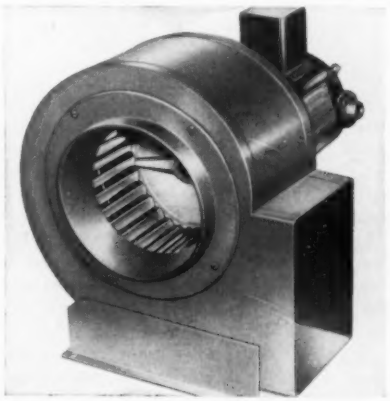
The globe guard, globe-holder, and cord connector housing of this 4¾ lb., explosion-proof, rain-tight hand lamp are of aluminum, while the lamp receptacle housing is of molded phenolic composition. The globe is seated firmly against a metal flange by a heat and impact-resistant globe guard. Both lamp chamber and handle are explosion-proof, the company reports. Another safety feature, the use of pressure type wire connectors in the cord connector assembly, is said to minimize the danger of wires being pulled free. Rubber bushings are supplied with the fixture to accommodate ⅜" to ⅝" cord.

Also, the company has introduced a light-weight, explosion-proof trouble lamp designed for use at hazardous locations where explosive gases or vapors are present. The trouble lamp consists of a cast aluminum cylindrical-shaped lamp chamber, concentrating lens, composition handle, support hook and explosion-proof cord connector with mechanical cord grip. Flame-tight threaded joints located around the lens housing and top and bottom sections of the lamp compartment, confine explosion flames to an area within the lamp compartment if one or more explosions take place in the lamp compartment. A 12-volt auto lamp provides the beam of light, concentrated by the lens.

Type EVH 103 Hand Lamp, Type EPLH Lamp. Crouse-Hinds Co., 7 North St., Syracuse, N. Y.

Blower

Designed for the quick removal of fumes, smoke, and stale air, or for cooling and ventilating, this new large-capacity



blower offers a 6-inch wheel. Moving up to 600 cubic feet of air per minute the blower features an automatic cutout which stops the completely enclosed 110 V., 60 cycle motor before it can overheat. Smaller sizes with different capacities and current characteristics are also available.

High-Volume Blower. Standard Electric Mfg. Co., Inc., West Berlin 12, N. J.

Flowmeter

A dial indicating gas flowmeter, this unit consists of a differential pressure gauge across a linear pressure drop flow element.

It was designed for measuring the rate of flow of gases at pressures up to 20 psig. For vacuum service, it is operable to absolute pressures as low as ½ psia, suction of 28" of mercury. Neither the flow element nor the indicator require levelling, the company reports, and the use of a mechanical differential pressure gauge makes it possible to operate the flowmeter over the temperature range from —60° F to + 180° F. Full scale

flow ranges are available from 0.003 to 30 cfm for most gases.

Model 30 Vol-O-Flo. National Instrument Laboratories, Inc., 6108 Rhode Island Ave., Riverdale, Md.

Coupling

This dual purpose coupling was designed for use as either a permanent coupling or for the repair of gas, water and oil lines. A

split compression type coupling, the unit exerts uniform pressure throughout the full length of the sleeve and forms a leak-proof seal. Available in 5 sizes from 4″ to 14″, inside diameter, with lengths from 8″ to 12″, the coupling is furnished with rubber gaskets, or when specified, in neoprene or other materials. The inner sleeve and outer shell of the standard coupling are constructed of heavy zinc-coated steel, but couplings made of aluminum, stainless steel, copper-clad, and other metals, can be furnished on special order. The nuts and bolts are zinc coated, heavy duty type. Only a single wrench is required for tightening.

Morris Dual-Purpose Coupling. Morris Coupling and Clamp Co., P.O. Box 632, Elwood City, Pa.

Volt-amp meters

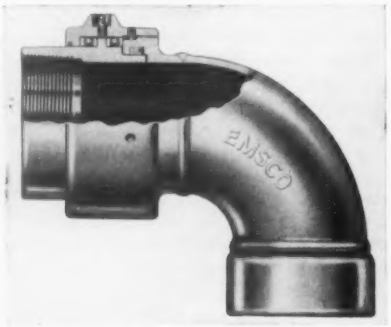
Three new volt-amp testers have been introduced with designs to fill the needs of maintenance men and plant electricians.

Each comes with two voltage ranges, 0-150/600 v, AC, and with ampere ranges of 0-25, 0-50 or 0-100, AC. For those who work generally with 110 or 220 v services, a tester is available in 0-125/150 v models, with current ranges of 0-10, 0-25, 0-50 or 0-100 amps. It gives readings without the necessity of shutting down equipment.

Amprobe Junior. Pyramid Instrument Corp., Lynbrook, N. Y.

Low pressure joint

An addition to the company's ball bearing swivel fitting line, this fitting is designed for applications and pressures to which schedule 40 pipe would be subjected and is made for a maximum pressure of 1,000 psi at a maximum temperature of 225°F. Other types are available for pressure up to 15,000 psi and temperatures to 7,500 F. Said to feature easy turning at low torque,



low resistance to flow and all around safety, the thrust load is taken through the center of the balls. The hardened and ground races on which a double row of ball bearings rotate are perpendicular to the lines of force. Packing materials are independent of the ball rows and are unaffected by ball race wear. End connections may be scarfed, bored for welding, threaded or flanged to meet specifications.

Type LPR Emsco Fitting. Emsco Mfg. Co., P.O. 2098, Terminal Annex, Los Angeles 54, Cal.

Plastic clamp

Utilized to effect a tight, permanent seal when sections of flexible plastic pipe are connected by means of insert couplings,

tees, ells and adapters, this molded plastic clamp is slipped over the pipe ends and tightened to force them down onto the serrations in the insert fittings to create a leak-proof connection. It is molded in two separate threaded sections. Butted against a shoulder at the base of the female threads in one half is a synthetic gasket with a v-shaped groove. When the other half is screwed down onto the gasket it is forced against the pipe. The unit is said to be impervious to rot, rust and electrolytic corrosion. When the clamp is positioned the gasket is completely enclosed by plastic. The clamp is produced in sizes for ½, 1, 1½, 2, 3, 4 and 6-inch plastic pipe. It is tightened by means of a strap wrench.

Carlon Molded Plastic Clamp. Carlon Products Corp., 10225 Meech Ave., Cleveland 5, O.

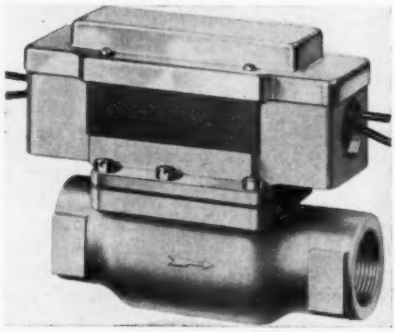
Portable fire extinguisher

A new line of air pressurized dry chemical fire extinguishers, each unit is portable by one man, and is ready to operate when the pin is pulled and the lever squeezed. The efficiency of the unit is reportedly aided by a specially designed discharge nozzle which fans the dry chemical outward and downward in wide pattern with great density. When partially operated, the unit can be left standing without loss of air pressure, should a fire reflash before the extinguisher is recharged. Equipped with safety relief valve, water-tight and non-corrosive. Tested for vibration and for operation at temperatures from minus 40° F to plus 150° F. Underwriters' Laboratories approved for class B and C fires.

Alfco Dry Chemical Fire Extinguishers. American-LaFrance-Foamite Corp., Elmira, N. Y.

Control valve

A new main control valve using a rotor operating in a magnetic field instead of a solenoid, this control is offered in a low

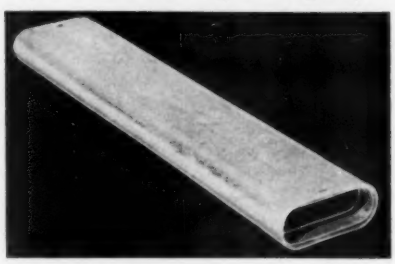


voltage model in ¾″ size. It has a capacity of 170,000 Btu/hr with manufactured gas and 252,000 Btu/hr with natural gas. Characteristics of the valve, according to the manufacturer, are such that greatest force is exerted at the beginning of the stroke when the valve must open against gas pressure, resulting in the valve's having less tendency to stick. It closes against a synthetic rubber seat. The transformer is built into the control, and can be turned end for end to facilitate wiring. The transformer is replaceable. The valve body can be mounted in any position through 360° around the centerline of the valve.

Actrol Valve, Model MA5G1. Milwaukee Gas Specialty Co., Milwaukee, Wis.

Gas vent pipe

A new gas vent pipe designed especially for in-the-wall venting, this pipe has a narrow, oval cross-section permitting easy in-



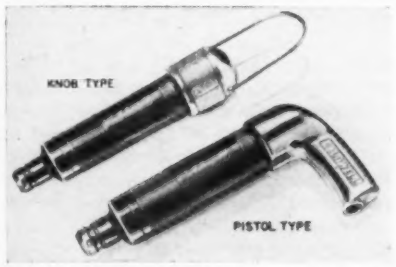
stallation inside a wall without extensive special construction or extra insulation. It features an inner and outer pipe separated by an insulating air space. A new coupler enables pipe sections to be joined without cement or mastic, and without screws except where the vent will be left exposed in rooms or attics. The outer pipe is galva-

nized steel which, the manufacturer states, lessens the chance of accidentally damaging the vent during handling and installation. Aluminum is used for the inner pipe to provide a fast-heating inner hot stack and to give maximum corrosion resistance.

WV Metalbestos. Metalbestos Div., William Wallace Co., Belmont, Cal.

Pneumatic hammer

An air tool for drilling, chipping, trimming, scaling and sealing, this hammer measures 9¾" in overall length with a 1⅝"

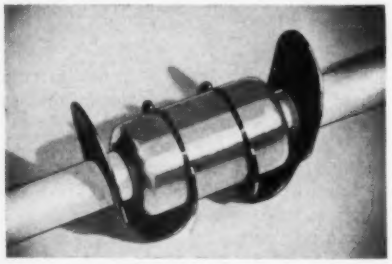


barrel diameter. Offered in two handle styles, the pistol type and the knob type, it is automatic in that it operates when pressed into contact with the work and stops when withdrawn. Tools are readily inserted in the unit, held firmly and removed easily by hand from the chuck, it is reported. Weighing approximately 5 lbs., the unit operates on pressures from 30 to 100 lbs. in accordance with work requirements.

Caldwell Hammers. Burgess Thomas Co., P.O. Box 287, Bloomfield, N. J.

Coupling

Designed to simplify the connecting of tubing or pipe in any size range, this new coupling requires no threading, flares, fer-



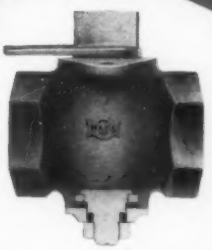
rels or tools of any kind, the company reports. The operation is described as: press the spring clip, insert the tube, release the spring. At each end of the coupling are grooves containing rubber O-rings, or silicone, or tefalon rings, depending upon use. The sleeve is tapered on the inside to allow for any variation in the outside diameter of the pipe. The coupling has a stop in the center that allows the pipe to fit equally in each side. The spring clip grips tighter, the company states, as pull pressure is applied. The new coupling will be available in all sizes for all applications, and will be available in different materials and designed with special O-rings for any type of liquid, gases or temperatures. Available also as tees, elbows and connectors with a threaded end and hexagon outside for connecting into present equipment.

Meca Coupling. The Master Enterprise Corp. of America, Boulder Building, Tulsa, Okla.

for STOPS that are TOPS

IT PAYS TO BUY HAYS®

7405
Iron Body, Galvanized,
Bronze Plug Stop



7490
"Key-Lok" Tamper Proof Stop
Lockwing—Iron Body,
Bronze Plug

7500
Threadless Gas Stop
Iron Body, Brass Plug

Service Line Stops—Meter Stops
Appliance Stops

Tamper Proof and Standard Patterns

Iron Body with Brass Plug
Black or Galvanized
Also All Brass Stops

Flat Head—Flat Head with Lockwing

Full Range of Sizes

Quality Assured . . .
By Precision Machining—
Individual Testing—
Rigid Inspection

Quality Proven . . .
By Supplying the Gas Industry
for Over 80 Years

Standard Packaging for Easy Handling,
Space Saving Storage . . . Another HAYS First

Write for literature, or ask "The Man from Hays"

HAYS
GAS SERVICE PRODUCTS
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ERIE, PA.

NEW BULLETINS

DYNAMIC FLOW CONTROL. A valve-mounted controller for high speed flow control applications is described in this bulletin, which covers a typical flow control system, dividing it into its four components: the controller; the set point transmitter; the measurement transmitter, and the control valve. An explanation of the controller mechanism is presented in the bulletin and it centers on the provisions for proportional, derivative and reset control actions. Four bellows operate within a sealed case to position a balance-beam and apply corrective output pressure to the control valve in response to a process upset or control point change. Complete controller specifications and diagrams are included in the bulletin.

Bulletin 470. Pp. 8. The Foxboro Co., Foxboro, Mass.

HONEYWELL ELECTRONIK VERTICAL SCALE INDICATOR. This new bulletin describes the manufacturer's new 6½-inch-wide instrument for the rapid and precise multiple indication of any variable that can be transformed to millivolts. Designed for applications where panel space is limited, the indicator is available in two models, one with 12-second full scale travel and the other with 4½-second full scale travel. The bulletin presents information on readings, circuit, motor, slidewire and calibration. Also, data on specifications and options are presented.

Bulletin 1541. Pp. 8. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Avenues, Philadelphia 44, Pa.

FURNACE AND OVEN CONTROL CATALOG. A catalog of complete control systems for furnaces, ovens, dryers and kilns, this new bulletin contains all detailed engineering specifications necessary for choosing a particular installation. Several potentiometer models and millivoltmeter type pyrometer controllers, recorders and indicators, as well as bulb-and-tubing recording or controlling thermometers are described. Electric control relays, motor operators and controllers are included, in addition to electric and air operated control valves. More than 100 photos and application and dimension drawings illustrate the bulletin.

Bulletin No. P1260. Pp. 48. The Bristol Co., Waterbury 20, Conn.

ECLIPSE FAN TYPE COMBINATION OIL-GAS BURNERS. The fan type combination burners described in this bulletin are designed for gas and light oils, oil or gas. The burner is described as being self-contained in one complete package, for industrial and commercial use, and it includes: blower, burner, oil pump with motor, tuyere, mixer, safety equipment, transformers, valves, regulators, filter, piping and wiring. The bulletin contains photographs of the burner and parts, and a listing of all specifications and dimensions.

Bulletin R-100. Pp. 4. Eclipse Fuel Engineering Co., 1001 Buchanan St., Rockford, Ill.

REPUBLIC PLASTIC PIPE. With the introduction of its newest product, plastic pipe, the company has issued a bulletin which tells why it has entered the plastic pipe field. The bulletin, in color, describes the two principal types of plastic pipe made, shows how to join plastic pipe and lists various engineering and corrosion data. It offers information on advantages of the pipe, how it is made, and applications of semi-rigid and flexible pipe. Also presented are size and weight tables and estimated safe working pressure tables, for both the semi-rigid and flexible plastic pipe.

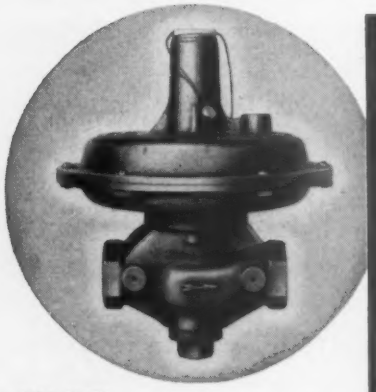
Bulletin Adv. 603. Pp. 12. Advertising Div., Republic Steel Corp., 3100 E. 45 St., Cleveland 27, O.

ECLIPSE GAS-FIRED CRUCIBLE FURNACE. The furnaces described in this new bulletin are designed for melting non-ferrous metals. The various types of furnaces illustrated consist of standard units designed for heavy foundry production in the melting of brass, bronze, aluminum and other alloys, for use in the melting of red and yellow brass and aluminum, and for die casting work. The bulletin offers a section devoted to gas combustion equipment, and a section on technical data.

Bulletin No. C-2. Pp. 8. Eclipse Fuel Engineering Co., Rockford, Ill.

Steady

REYNOLDS LOW PRESSURE REGULATORS



PIPE SIZES:
¼" to 8"
¼" to 3" with screw connections
3" to 8" with flange connections

Reynolds Low Pressure Regulators guarantee steady, constant, unvarying outlet pressure even though the volume varies and inlet pressure fluctuates. Precision built and delicately balanced for accurate performance on low pressure installations, the units illustrated are backed by factory tests over a wide range of operating conditions. Reynolds Low Pressure Regulators are economical and safe. Our Engineering Department is at your service.

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Eastern Appliance Company
281 Vassar Street
Cambridge, Massachusetts

Waldo S. Hull
258 Lee Circle
Bryn Mawr, Pennsylvania

GAS CONTROL Since 1892

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

SELAS SOLDERING FURNACES. A new soldering iron furnace that is capable of heating two 4-pound irons from room temperature to 900°F, or one iron to 1,200 F°, in less than eight minutes, is described in this new bulletin. Features of the soldering furnace described in the bulletin include facts about heating, production, copper life, tinning, operator comfort and maintenance. In addition to a chart showing dimensions of the furnace there are tables on operation and performance data, and a schematic diagram presenting a hookup of multiple installations of bench furnaces.

Bulletin SC-1038. Pp. 4. Selas Corporation of America, Philadelphia 34, Pa.

WHEELCO DATA BOOK AND CATALOG. A liberally illustrated bulletin containing many valuable tables, this catalogue was designed for the use of anyone interested in solving process control problems. A complete line of thermocouples, radiation detectors, and resistance bulbs are shown in the bulletin, and it presents a great deal of information concerning various sensing units as well as tips on instrument servicing. The bulletin also includes information on protection tubes, lead wire and other accessories for use with indicating, controlling, and recording instruments.

Bulletin TC-10. Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill.

NEW 077 ELECTRONIC TEMPERATURE CONTROLLER. This bulletin presents information about the manufacturer's new electronic temperature controller, which now has a range extended to cover —100° to +600°F. The bulletin also contains complete specifications and application information on the controller in both the single-point and the new cascade model, as well as data on resistance thermometer elements and wells, and facts on control motors suitable for use with the new controller.

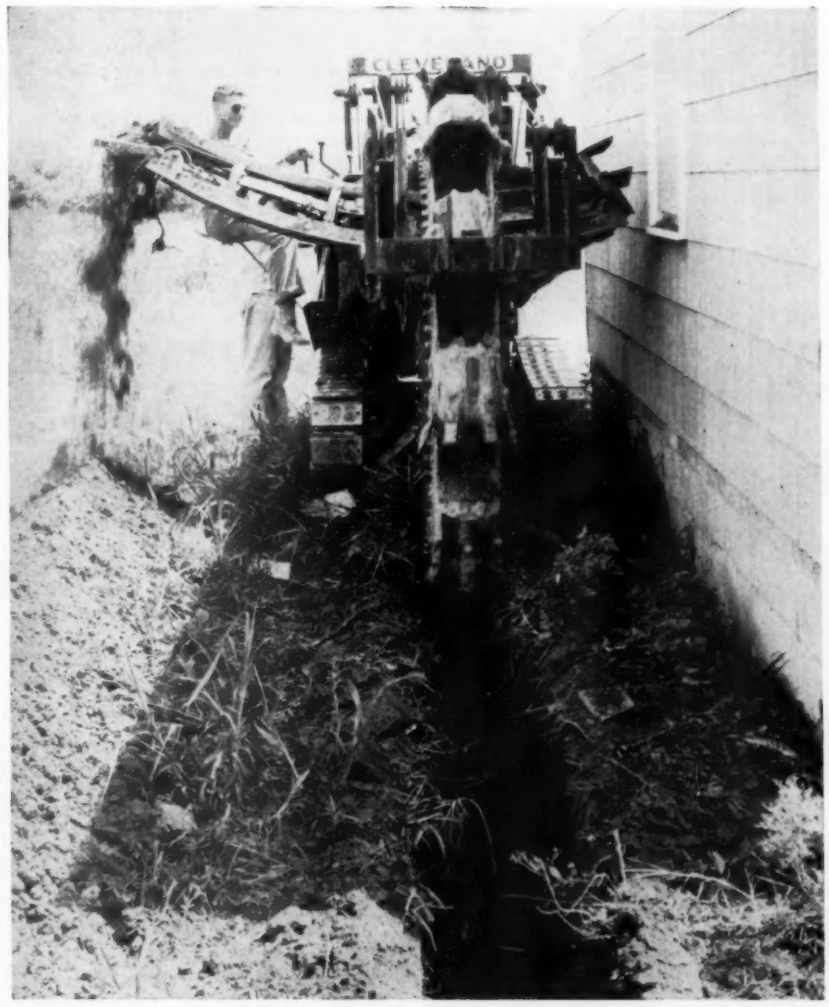
Bulletin P-811. Pp. 8. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Avenues, Philadelphia 44, Pa.

PYRO OPTICAL PYROMETER. Detailed information on the company's optical pyrometer is presented in this new bulletin, and it offers technical data on the principles of optical pyrometry and illustrations of applications. Features of the pyrometer that are discussed in the bulletin include: it is self-contained, offers direct reading, ease of operation, accuracy, self-calibration and versatility. There is information on the principles of operation, maintenance and accessories, and a listing of models and specifications.

Bulletin No. 85. Pp. 8. The Pyrometer Instrument Co., Inc., Bergenfield, N. J.

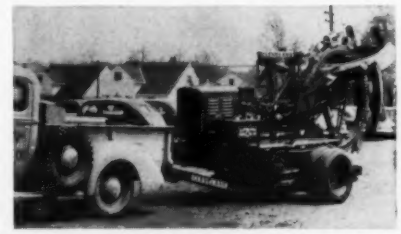
HAUCK PREFABRICATED THAWING PITS. How to solve the winter problem of thawing frozen railroad hopper cars of coal, limestone and ores, with radiant heat, is described in this new bulletin. The method avoids the use of direct flame contact, and because of the absence of impingement on the car, avoids damage to car hoppers. The bulletin offers information on fuel consumption and thawing, and presents specifications of the thawing pit.

Bulletin No. 1041. Pp. 4. Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N. Y.



20" from Trench to Wall

IN NORFOLK, VA. this Model 92 CLEVELAND "Baby Digger" shows how its useful compactness enables it to place a trench safely within 20" of a house wall. Balanced perfectly on its smooth full crawlers, the 92 maneuvers easily in even the closest quarters, with less damage to lawns, walks and driveways. Because it digs any size of trench from 10 to 20 inches wide and up to 5 feet deep, it is usable on a wide variety of jobs.



The 92 hustles safely from job to job . . . at legal limit speeds . . . because it's so easily portable on the drop-axle, tilt-bed CLEVELAND T5 Trailer.

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"Pioneer of the Modern Trencher"

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– Hot Fogging

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Rubber Gaskets

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GAS PURIFYING MATERIALS CO.
3-15 26th Ave.,
Long Island City, N. Y.

GOLDAK MODEL LC5 COMBINATION PIPE-LEAK LOCATOR. An electronic multi-purpose instrument designed for solving both pipe location and leak problems is described in this new bulletin. Features of the electronic locator which are discussed in the bulletin include: operation, construction, and replacement of parts. Overall size of the instrument is 6" by 9" by 12". Other specifications are presented in the bulletin.

Bulletin Goldak Model LC5. Pp. 2. The Goldak Co., 1544 W. Glenoaks Blvd., Glendale 1, Cal.

GASMACO OIL GAS PROCESSES. A brief description of the company's oil gas processes and equipment are presented in this new bulletin. Processes for flexible gas production; for base load, for peak shaving and for standby are presented. Typical applications of the oil gas process are given, along with information for remodeling an existing 3-shell water gas set into apparatus for production of hi-Btu oil gas. Information is also presented on 2-shell inverted U and 4-shell applications.

Bulletin A-207. Pp. 8. The Gas Machinery Co., 16100 Waterloo Road, Cleveland 10, O.

NORTON REFRACTORIES FOR HEAT AND POWER. Designed to help in the selection of the proper refractory products for critical areas in boilers for heat and power, this bulletin contains detailed information on the characteristics and manufacture of the company's refractories; data on products for air-cooled wall protection; solid wall protection, water tube protection and brick laying and general repairs. Also included are helpful suggestions on the use of the company's refractories for many different types of boilers. The bulletin was designed for the benefit of boiler operators, setters and engineers to aid them in solving refractory problems.

Bulletin Norton Refractories for Heat and Power. Pp. 32. Norton Co., Refractories Div., New Bond St., Worcester 6, Mass.

BARBER COLMAN ELECTRONIC CONTROLS. Complete information on the company's electronic controls and heating, ventilating, and air-conditioning is available in this new bulletin. It describes the flexibility of the electronic controls system. Descriptive information concerning the ultra-sensitive micro relay which simplifies the amplifier is also included. The bulletin also contains a complete description of the various elements required for system application and illustrates their usage. The bulletin contains photographs, charts and a schematic 3-element installation.

Bulletin F 6166. Pp. 8. Barber-Colman Co., Rockford, Ill.

NORTON CUT-OFF WHEELS. An instructive manual giving information on various types of cutting-off machines and abrasive cut-off wheels, their selection, application and proper usage. This bulletin also contains photographs of typical cutting-off operations, and various tables for wheel selection and conversion of wheel speeds to feet per minute values.

Norton Cut-Off Wheels. Pp. 36. Norton Co., Worcester 6, Mass.

CLEVELAND TRENCHERS AND BACKFILLERS. The complete line of the company's trenching equipment is described in this bulletin. It has been arranged so that a quick comparison is permitted, of the digging capacity and specifications, of four standard machines for city and suburban utilities and pipeline trenching. The text briefly describes specific advantages, typical job applications, and special features of each model. On another page of the bulletin is presented the company's big pipeline team of trencher and backfiller for handling any and all pipe sizes.

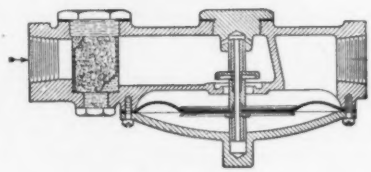
Bulletin Cleveland Full Line. Pp. 4. The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, O.

TOOLS AND ACCESSORIES FOR PAVING BREAKERS. A listing of the company's complete line of tools and accessories for paving breakers is presented in this bulletin. The various units of the paving breaker line, with illustrations and specifications, are described and the bulletin contains an index which enables the reader to immediately locate the page which describes the tool or tools the reader is interested in. Each tool or accessory is illustrated and its recommended applications are listed. A table of weights and sizes is presented with each illustration. Also, a page is included which offers specific instructions for reforging and re-hardening moil points, chisels and wedgepoints.

Bulletin 4126. Ingersoll-Rand Co., RD, 11 Broadway, New York 4.

Don't Take Chances With
Gas-Oxygen Mixtures

Use NORWALK'S DIAPHRAGM OPERATED CHECK VALVE



For Gas-Oxygen Service

- Recommended where gas is mixed with oxygen. Prevents even smallest quantity of oxygen from entering gas lines.
- Glass Wool Filter prevents passage of foreign matter to valve or valve seat.
- Safely withstands back pressures up to 15 lbs.

Send for Bulletin No. 3000

NORWALK VALVE COMPANY
South Norwalk, Conn.

SKINNER-SEAL VALVE AND BIBB RESEATER. The valve and bibb reseater described in this bulletin is designed to house either the 2" size tool for ½" — 2" valves and ¼" — ¾" bibbs, or the 3" size for ½" — 3" valves and ¼" — ¾" bibbs. The bulletin points out that bar type cutters operating under screw feed, leave worn, scored seats glass smooth, level, absolutely tight. Low spots on the seats, grooves, uneven places, have no effect. The cutter rotates on a level plane and is advanced by slight turns of the feed screw until the job is done. The tool provides a full range of guide pilots, cutters, spindles, tapered bushings plus hand wheel and bitt brace.

Bulletin, Skinner-Seal Valve and Bibb Reseater. Pp. 4. M. B. Skinner Co., South Bend, Ind.

FAIRBANKS LP-GAS VALVES. Illustrating and describing the company's complete selection of new LP-gas valves, this bulletin furnishes construction details, basic specifications, and valve applications for the bronze globe, angle, check, spring-loaded check and gate valves which have the Underwriters' Approval for LP gas service and carry the required 400# W.O.G. pressure rating. The valves are recommended for all common commercial forms of LP gases whether handled in liquid or gaseous state and are designed for application on all types of piping systems for storing, transporting, and utilizing these gases.

Bulletin #V-110. Pp. 4. The Fairbanks Co., 393 Lafayette St., New York 3, N. Y.

GILSULATE—THE TRIPLE-ZONE INSULATION. Information pertaining to the installation of this insulation for hot underground pipes is presented in this well-illustrated bulletin. The insulation is poured around pipes exposed in trenches, and provides, the bulletin points out, permanent thermal insulation and corrosion protection against acid and alkaline ground waters, bacterial action and electrolysis.

Bulletin on Gilsulate. American Gilsonite Co., 134 West Broadway, Salt Lake City 1, Utah.

BAILEY METERS & CONTROLS FOR THE PROCESS INDUSTRIES. The manufacturer's complete line of instruments for metering and automatically controlling 17 process variables are described in this bulletin. Written for process and instrument engineers, it offers ranges, basic specifications, and detailed literature references on all instruments. The bulletin is generously illustrated with photographs, diagrams and charts.

Bulletin 17-E. Pp. 16. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.

HAUCK SELF-CLEAN METERING OIL VALVE. For use with any high or low pressure oil burner, on any type of furnace, kiln, oven, dryer, heater or boiler, the self-cleaning control valve described in this bulletin is said to offer visible, positive, accurate control from full opening to full shut-off. Discharge is directly proportional to the setting on the calibrated dial. The valve, which can be operated manually or in automatic control systems, has uniformly graduated capacity. The indicator dial enables duplication of previous settings. In 2 colors, the bulletin describes features of the valve with charts, illustrations and diagrams.

Bulletin #707A. Pp. 4. Hauck Manufacturing Co., 124-136 Tenth St., Brooklyn 15, N. Y.

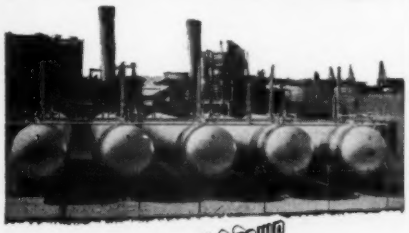
ECLIPSE PISTON-TYPE OIL RELIEF VALVE. A piston-type oil relief valve for regulating pressure on the company's new series of closed flame gas-oil burners is described in this new bulletin. A cylindrical steel piston closes the port with a quick, positive shearing action which, the manufacturer reports, does away with chattering and pulsation. Pressure in the valve is closely regulated by adjusting tension of the spring inside the piston. Five different spring sizes permit a wide range of pressures from 0 to 500 lbs. The valve piston and spring are said to be easily removable for field servicing without dismantling of the entire valve being necessary. The valves are available in four sizes from ⅜" port to 1" port.

Bulletin R-313. Pp. 2. Eclipse Fuel Engineering Co., Rockford, Ill.

LINCOLN WELDDIRECTORY FOR HARD SURFACING. This bulletin on hard-surfacing worn steel parts is pfefaced by the considerations in choosing a surfacing material. The bulletin then presents a guide for selection of electrodes, together with the specific electrodes and the surfacing applications for which they are intended.

Bulletin 466. Pp. 20. The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17.

NATURAL GAS STANDBY



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This packaged propane plant designed, engineered and built by Draketown, provides a completely interchangeable fuel for natural gas.

Draketown can design and build one for you, *within your budget,* to take over all or part of your load at the turn of a valve.

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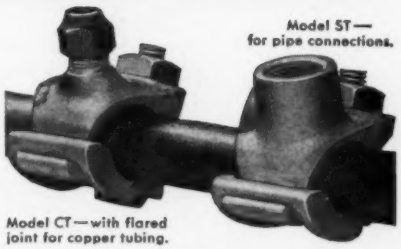
Quick easy way

to make gas connections

FOR LAUNDRIES, DRYERS, REFRIGERATORS, AND OTHERS



Model ST—for pipe connections.

Model CT—with flared joint for copper tubing.

SKINNER-SEAL SADDLE TEE—for making gas and water connections. No pipe cutting or threading. Quick. Easy. Cuts costs. For gas refrigerators, home laundries, heaters, etc. Write for circular.

Approved by Underwriters' Laboratories, Inc.

M. B. SKINNER CO.
SOUTH BEND, 21, IND., U. S. A.

METAMETER MULTIPLEXING TELEMETERS. A description of the manufacturer's new multiplexing transmitting and receiving system is the main subject of this new bulletin. Information is contained on the use of the system for transmitting up to 15 readings, over a single circuit and distance, of pressure, vacuum, temperature, flow, water or liquid level, static and differential pressure, motion, voltage, current, or totalized load taken at separate locations or areas to the receiving instruments. The bulletin also describes a typical installation.

Bulletin M1712. Pp. 4. The Bristol Co., Waterbury 20, Conn.

INTERNAL DOWNFLOW ANDERSON PURIFIER. This bulletin on internal downflow purifiers for steam drums, flash tanks, evaporators, packed towers and deodorizers, features two pages of selection tables which are presented as a guide to the user in selecting purifiers for any steam, air, gas or vapor installation. With these charts are shown typical examples of the solutions. The bulletin contains: description of operation, principle advantages and use, a table of dimensions, weights and specifications.

Bulletin No. 401. Pp. 4. The V. D. Anderson Co., 1935 W. 96 St., Cleveland 2.

MERIAM PITOT TUBES. The pitot tubes described in this bulletin are of the combined pitot-static form, with impact and static tubes in fixed relationship to each other, and are reportedly arranged in compact, but rigid form, not easily distorted by high velocity impact pressures. The tubes are designed for use in investigation of velocities and impact pressures in air conditioning work and related fields, and are employed in measuring pressure distribution along sections exposed to air currents. The bulletin describes pitot tube construction, principles of operation, application and installation. It contains illustrations, calculations, and air and water tables.

Bulletin 51. Pp. 8. The Meriam Instrument Co., 10920 Madison Ave., Cleveland 2.

CAST IRON PIPE STANDARDS. A series of recently published standards for cast iron pipe, these new standards provide uniformity in methods of determining the thickness and length of cast iron pipe, depending upon the pipe's diameter and the pressure it must withstand. The specifications also include data on reasons for failure of cast iron pipe and methods for preventing corrosion. The standards were developed under an ASA committee made up of 35 producers, users and other groups interested in standardization of the pipe. American Gas Association, one of the sponsors, aided in the completion of the project. The following standards, available from American Standards Association, 70 E. 45 St., N. Y., are applicable to the gas industry:

Cast Iron Pit Cast Pipe for Gas, A21.3-1953. Price per copy, $0.25.

Cast Iron Pipe Centrifugally Cast In Metal Molds, for Gas, A21.7-1953. Price per copy, $0.25.

Cast Iron Centrifugally Cast In Sand-Lined Molds, for Gas, A21.9-1953. Price per copy, $0.25.

AN INTRODUCTION TO FLOWRATOR METERS. The meters described in this bulletin are designed for flow rate measurement of liquids and gases by the variable area method. The bulletin presents facts about the meters and presents comparisons between variable-area types and variable-head meters. How the variable-area meter works, its basic flow equation, as well as information on calibration scales, metering range, permanent pressure loss, upstream piping effects, viscosity effects, purging, and pulsating flow, are all discussed. There is a section detailing how the meter works, and one containing specification data.

Catalog 10-A-10. Pp. 16. Fischer & Porter Co., Hatboro, Pa.

ECLIPSE FURNACES. Air draw, salt pot, metal melting, large oven, forging and small shop furnaces are all briefly described in this new bulletin issued by the manufacturer to show the company's line of standard, gas or oil fired, or combination gas-oil fired, furnaces. In addition to descriptions of the standard furnaces, there is a section on special furnaces designed for particular heating requirements.

Bulletin D. Pp. 4. Eclipse Fuel Engineering Co., Rockford, Ill.

L&N MANUALLY-OPERATED INDICATORS FOR TEMPERATURE, CONDUCTIVITY OR pH MEASUREMENTS. Complete information about how manually-operated portable and panel indicators are being used to measure temperature, electrolytic conductivity or pH is contained in this bulletin. It describes the design and operating accuracy of the indicators which are direct reading in terms

IRON SPONGE

for high efficiency gas purification at high pressures

Iron Sponge is your key to sulfur-free gas at minimum processing cost. Iron Sponge has high efficiency at low pressures or at today's high pressures and high temperatures. It absorbs *more* H_2S, gives long service between foulings, and is easily regenerated. Investigate it for your purification problem today!

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How automatic controls and heating and air conditioning equipment work together for best results

AUTOMATIC CONTROL of HEATING and AIR CONDITIONING

By JOHN E. HAINES
Vice-President
Minneapolis-Honeywell Regulator Company
354 pages, 6 x 9, 200 illustrations, $6.75

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Electric-control
Pneumatic-control

AND CONTROL OF
Domestic heating
Unit heaters and unit ventilators
Commercial central-fan heating systems
Commercial central-fan cooling systems
Commercial refrigeration
Radiant-panel heating

Just Published!

AMERICAN GAS JOURNAL
205 East 42 Street
New York 17, N. Y.

of the variable under measurement. A feature of the bulletin is the arrangement of instruments according to application. Listings in tabular form of all specifications for both the indicators and accessories are included. Contains photographs of indicators, and typical installations.

Bulletin ND42. Pp. 22. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44.

WORTHINGTON HIGH SPEED STEAM TURBINES. High speed steam turbines for centrifugal compressor and blower drives are the subject of this new bulletin. It describes manufacturing and engineering features of the turbines including four types of governing arrangements, hand and automatic nozzle controls, and other controls and accessories. There are sections included in the bulletin on types and sizes for every requirement, single stage or multi-stage, and installations. The bulletin is liberally illustrated with photographs, charts and diagrams.

Bulletin No. 1966-536-BP. Pp. 18. Worthington Corp., Advertising and Sales Promotion Dept., Harrison, N. J.

MODERN STEEL BOLTING FOR PIPING AND PRESSURE VESSELS. This bulletin offers comments on each ASTM specification plus tables on the compilation of properties and bolting selection. Also included is a discussion on the behavior of bolted flanged connections of the types used in piping and pressure vessels. This bulletin has been prepared in the belief that engineers will find it useful in making the proper selection of bolting material, the company reports.

Bulletin 524. Pp. 22. Taylor Forge & Pipe Works, Inc., Chicago 90, Ill.

GAS ANALYSIS APPARATUS. Listings and descriptions of equipment and accessories for gas analysts are presented in this amply-illustrated new bulletin. It outlines methods in brief, lists many different models and types of apparatus and offers aid for their proper selection. All major items are described in detail, and a complete subject index is keyed to page numbers. Five pages are devoted to an offering of laboratory models of gas analyzers which include the manufacturer's Build-Up design as well as cabinet models. Listed accessories for gas analysts include reagents and solutions, manifolds, burettes, pipettes, oxidation equipment, sampling tubes and parts and accessories for the company's apparatus. Each page of the bulletin may be identified by subject in the upper corner.

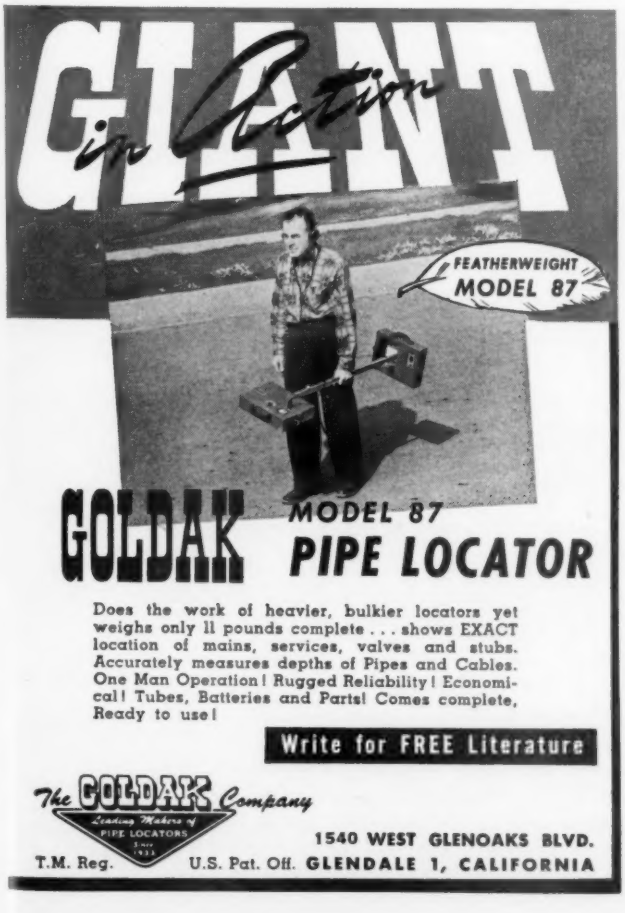
Catalog 81. Pp. 44. Burrell Corp., 2223 Fifth Ave., Pittsburgh 19.

HAUCK DOUBLE JACKETED MELTING FURNACE ON WHEELS. Recommended for melting rubberized joint sealers, such as rubber and plastic, rubber and asphalt, etc., the melting furnace described in this bulletin is said to offer close temperature control by means of indirect heat. Mounted on wheels, it is said to be easy to handle and operate, and can be moved from one location to another by one man, unassisted. An oil with high flash point is used as a heat transfer medium. LP gas is used as fuel. Furnace can be used with or without the removable agitator. Available with draw-off cock where specified. The manufacturer reports that the critical maximum temperature can be maintained during continuous pouring, adding cold material as the melted material is used. Information on general construction, and instructions for operating are included.

Bulletin No. 1081. Pp. 2. Hauck Manufacturing Co., 124-136 Tenth St., Brooklyn 15, N. Y.

ECLIPSE GAS-FIRED TANK HEATER. The tank heater described in this bulletin has a welded steel tank of three piece construction with an immersion coil element in the bottom of the tank. The burner equipment consists of an atmospheric type immersion burner. Gas consumption is noted in various tank sizes between 80,000 and 270,000 Btu/hr. Circular and rectangular tank heaters, with burners placed underneath the container, mounted on legs, are available with gas consumption figures of 100,000 to 122,000 Btu/hr for the former, and 66,000 to 270,000 Btu/hr for the latter type. Immersion type tank heaters for use with mixtures having sediment that settles to the bottom of the heater, with heating coils located above the tank bottom, are available in 7 tank sizes with maximum input ratings from 55,000 to 250,000 reported by the manufacturer.

Bulletin No. F-1. Pp. 4. Eclipse Fuel Engineering Co., Rockford, Ill.



GOLDAK MODEL 87 PIPE LOCATOR

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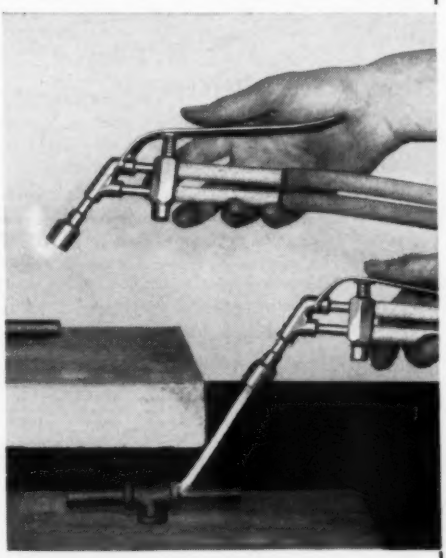

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GAS INDUSTRY CALENDAR

March

15-17 Mid-West Gas Association, annual meeting and convention, Fort Des Moines Hotel, Des Moines, Iowa.

25-26 Oklahoma Utilities Association annual convention, Biltmore Hotel, Oklahoma City.

25-26 New England Gas Association, Hotel Statler, Boston.

April

12-14 AGA Sales Conference on Industrial and Commercial Gas, Edgewater Beach Hotel, Chicago.

13-15 Southwestern gas measurement short course, University of Oklahoma, Norman, Okla.

20-23 AGA Distribution, Motor Vehicles and Corrosion Conference, Mount Royal Hotel, Montreal, Canada.

22-23 Indiana Gas Association, annual meeting, French Lick Springs Hotel, Chicago.

26-28 Mid-West Regional Sales Conference, Edgewater Beach Hotel, Chicago.

26-28 The 1954 annual convention, Southern Gas Association, Houston.

May

9-12 LPGA Annual Convention, Conrad Hilton Hotel, Chicago.

10 (week) 35th Annual National Restaurant Convention and Exposition, Navy Pier, Chicago.

10 (week) AGA commercial gas school, Chicago.

19-21 GAMA annual meeting, The Drake, Chicago.

24-26 AGA Production and Chemical Conference, Wm. Penn Hotel, Pittsburgh.

27-28 Natural Gas and Petroleum Association of Canada, Prince Edward Hotel, Windsor, Ontario, Canada.

June

20-24 Canadian Gas Association, Banff Springs Hotel, Banff, Alberta, Canada.

27-29 Wisconsin Utilities Association, accounting section annual convention, Dell View Hotel, Lake Delton, Milwaukee, Wis.

28-29 Michigan Gas Association, Grand Hotel, Mackinac Island, Mich.

July

12-16 National housewares and home appliance exhibits, Auditorium, Atlantic City, N. J.

19-23 Western summer radio-television and appliance market, Western Merchandise Mart, San Francisco.

September

8-10 Pacific Coast Gas Association, Vancouver and Georgia Hotels, Vancouver, British Columbia.

8-10 Mid-West gas school and conference, Iowa State College, Ames, Iowa.

28-29 Texas Mid-Continent Oil and Gas Association, Baker Hotel, Dallas.

October

11-14 AGA annual convention, Atlantic City, N. J.

18-22 National Safety Council, Chicago.

November

1-5 National Metal Exposition, Chicago.

8-11 American Petroleum Institute, Conrad Hilton Hotel, Chicago.

17-19 Wisconsin Utilities Association, gas and electric sections convention, Schroeder Hotel, Milwaukee, Wis.

28-December 3 The American Society of Mechanical Engineers, Statler Hotel, New York.

February, 1955

7-11 Western winter radio-television and appliance market, Western Merchandise Mart, San Francisco.

April, 1955

12-14 AGA sales conference on Industrial and commercial gas, Hotel Statler, Boston, Mass.

25-27 Mid-West regional gas sales conference, Edgewater Beach Hotel, Chicago.

May, 1955

9-13 National restaurant exposition, Navy Pier, Chicago.

16-18 Southern Gas Association, New Orleans, La.

23-25 GAMA annual meeting, Ambassador Hotel, Los Angeles.

June, 1955

5-9 Canadian Gas Association, annual meeting, General Brock Hotel, Niagara Falls, Ontario, Canada.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ontario, Canada.

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